Planning for ecological health and human well-being in the Credit River Watershed: Social well-being benefits of urban natural features and areas

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July 31st, 2014

A Major Paper submitted to the Faculty of Environmental Studies in partial fulfillment of the requirements for the degree of Master in Environmental Studies, York University, Toronto, Ontario, Canada

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Acknowledgements

A heartfelt thank you to my friends, family, and peers in supporting me through the realization of this paper and my MES degree. My parents have been a truly loving source of help and support, continuously encouraging my studies. A special thank you to Dr. Martin Bunch, my academic supervisor, who introduced me to the field of ecohealth through a shared interest in watershed management. His patience and encouragements are very much appreciated. I am also very grateful to Alexandra Belaskie, who was a great moral support and with whom I had the pleasure to spend many hours in the field and over coffee to swap ideas. Thank you to Mitch Harrow and Iftekhar Ahmad for their supporting role in the conducting of in-person surveys in all sorts of weather and even on weekends. I am also grateful to Mitch for compiling GIS information when I asked for it at the last minute. Thank you to Tatiana Koveshnikova and Mike Puddister for initiating the Watershed Well-being Project, giving me an internship opportunity, and providing much inspiration.

Foreword

The production of this Major Research Paper has contributed to many of the objectives outlined in my Plan of Study. By taking part in a project initiated by Credit Valley Conservation that eventually led to this study, I was able to explore the mandate and strategies of a watershed planning body. My involvement in the development of the "Watershed Well-being" project enabled me to learn in-depth of an Ontarian watershed management strategy (Learning Objective 5 of Component 1: Watershed Planning). While researching and designing a survey instrument, I also learned of various monitoring strategies used in the development of indicators (Learning Objective 1 of Component 3: Measures, Indicators, and Public Involvement).

During the surveying period, I took notice of *Notice of Application for Minor Variance* boards standing in one of our study areas. I also spoke to respondents about a recent public engagement strategy that was part of the Meadowvale Village Heritage Conservation District Plan Review and was given a paper copy of a related questionnaire to examine at home. These experiences led to the writing of a final paper entitled "Recommendations for Public Involvement in Meadowvale, Mississauga" for my Public Involvement in Planning course where I learned of different strategies with which to engage the public (Learning Objective 2 of Component 3). I was then able to apply the strategies learned through the design, organisation, and planning of focus groups (Learning Objective 3 of Component 3).

Finally, in the writing of this paper I was able to gain knowledge on policies and theories related to watershed management and ecohealth. In writing Chapter 2, which contextualizes the Credit River Watershed and outlines the current legislation that relates health and well-being to the environment, I familiarized myself with the main laws that facilitate or deter biological conservation and environmental planning in Ontario (Learning Objective 3 of Component 1:

Watershed Planning). In the writing of my literature review, I discussed the theory of ecohealth, as outlined in my learning objective to be familiar with the main principles of broad-viewed frameworks (Learning Objective 1 of Component 2: Perspectives).

All in all, "Planning for ecological health and human well-being in the Credit River Watershed: Social well-being benefits of urban natural features and areas" fits perfectly within my area of concentration of "Watershed planning for well-being and ecosystem health."

Abstract

The relationship between ecological systems and well-being is nearly intuitive, and it has long been assumed that the outcome of good watershed management is human health and well-being. This study seeks to make this relationship more apparent with a focus on the perceived effects of natural features and areas on social well-being in the Credit River Watershed, southern Ontario. The use of a survey instrument, inductive analysis, statistical tests for differences and association, and exploratory factor analysis determined that a variety of natural areas are considered by respondents to be important contributors to well-being. Streams and river management should be prioritized since visits to these spaces affect the perception of outdoor and social well-being relationships more strongly. Sense of community, an aspect of social well-being, is cultivated through opportunities for gathering and meetings provided by green space. Though streams and rivers, forests and wetlands, open green spaces, home gardens and functional green space contribute to an aspect of social well-being in one way or another, the associations are dependent on the respondent's location and context. Accessibility and distribution of green space, as well as diversity of natural features may be key in the differences between the perceived social well-being and natural environment relationships. Planning for social well-being therefore involves the management of diverse and biodiverse spaces.

Chapter 1: Introduction

"Human health depends on healthy environments, and human prosperity depends both on healthy people and ecosystems in good condition" (Charron, 2012). This principle can be applied at the watershed scale, with the proposition that healthy watersheds are essential for vibrant, lively communities that embrace the natural environment (Gosling & Williams, 2010; Hernandez et al., 2010). Conserving and restoring green space and natural features, especially in urban areas, contributes to the social well-being of residents (Bramston et al., 2010; Coulthard et al., 2011; Kuo, 2003; Maas et al., 2009; Ryan et al., 2001). This study explores the ways in which natural features and areas affect social well-being in two neighbourhoods of the Credit River Watershed, Southern Ontario. It generates insight into how different forms of natural features, or different types of green space, benefit different aspects of social well-being. It also explores the different household and neighbourhood attributes, such as income and education, that correspond to various aspects of well-being.

1.1 Problem

Urbanization often proceeds with the single-minded pursuit of the effective construction of residential areas, to the detriment of good habitat qualities for both humans and non-humans. Many alterations to the landscapes have compromised the health and integrity of ecosystems. For instance, urban watercourses are often channelized prioritizing drainage over other objectives, resulting in the loss of recreational attributes, aquatic and wildlife habitat, and aesthetic features (Boyd & Tufgar, 2001). Stream channelization reduces an ecosystem's ability to absorb rainfall, replenish groundwater, and reduce water flow. This contributes to increased flood risk and decreasing water quality, meaning that health and safety are also affected (Karr, 1999; Boyd & Tufgar, 2001).

Despite the growing body of evidence showing that healthy ecosystems are important to human well-being and mention of health-environment relationship in plans and policies, goals and recommendations to manage the environment for health and well-being are not well implemented. In urban areas, neither the natural environment nor human health and well-being are in prime shape. In Southern Ontario, forest cover averages 22 per cent instead of the minimum 30 percent forest cover needed to sustain a healthy ecosystem (Trees Ontario, 2012). Water quality in urbanized areas of the Credit River Watershed is fair to poor, and forest conditions poor to very poor (CVC, 2013). The Region of Peel's rates of obesity and chronic disease are alarmingly high, and it has some of the lowest active transportation rates in Canada (Dunn et al., 2009).

Continuous human settlement and rapid land development are often blamed for deteriorating environmental conditions (Brunckhorst, 2000; Trees Ontario, 2012). Additionally, residential density is substantially related to the degree to which residents rely on automobiles (Freeman, 2001). This trend is contributing to human inactivity, which, combined with unhealthy food choices, results in health issues (Parks and Recreation Ontario, 2007). Urban sprawl and low density development also affect social well-being by discouraging interactions between residents and "cut[ting] involvement in community affairs by 10 percent" (Williamson et al., 2005). In urban environments, the issues of tree canopy cover loss, poor water quality, increases of obesity and loss of social interactions are all interrelated and affected by the current patterns of development.

1.2 Approach

An approach to these issues is watershed-based management, at a scale also known as catchments and river basins, which provide "an ideal context to design integrated governance that addresses health, environment and socio-economic priorities" (Parkes et al., 2010). Credit Valley Conservation, a conservation authority in Southern Ontario working under the principles of

integrated watershed resource management, has a vision to "ensure abundant, safe, clean water for environmentally, socially and economically healthy communities within the Credit River Watershed" (CVC Water Report, 2012).

Working under the assumption that their management improves the well-being of residents, Credit Valley Conservation (CVC) has come to the realization that there is no systematic process for environmental managers to monitor how residents' well-being is actually affected. There is no process to measure and report on how changes in the watershed's environmental conditions influence human well-being or to monitor if and how the work CVC does improves residents' well-being (Koveshnikova, 2013). To tackle this problem, CVC has approached researchers at York University to collaborate on a project entitled "*Human Well-Being, Ecosystem Services and Watershed Management in the Credit River Valley: Web-Distributed Mechanisms and Indicators for Communication and Awareness*" also known simply as the "Watershed Well-being Project." It builds on the research led by Tatiana Koveshnikova and Mike Puddister from CVC's Stewardship and Restoration Department, which explored the importance of ecosystem services to human well-being in a survey-based technical report prepared by consultants in 2011. It also builds on the scholarship of Martin Bunch, the supervisor of this work and Professor at York University's Faculty of Environmental Studies, by illustrating the integration of water resources management with health and well-being.

The Watershed Well-being project's goals are to seek input from local communities to identify indicators of human well-being that connect to ecosystem services, to communicate ecosystem-well-being relationships, and to support governance and management activities in the Credit River watershed (Bunch et al., 2013). As part of this larger project, this study will focus on the benefits of natural features relevant to social well-being such as contributing to sense of place and social

interactions. By exploring the relationships between the two, environmental managers will be provided with stronger arguments for protecting green spaces to support social well-being as well as biophysical health, leading to "co-benefits" of improvement in both. This research will provide evidence to help address the problematic trends in environmental and human health caused by urban development.

A broad understanding of health and well-being inspired by the field of ecohealth is used as the framework of this study. This definition goes beyond the absence of disease and includes more complex ideas that highlight the linkages between the environment and humans. Among others, security (food, water, or human) and social relations (social cohesion and interactions) are key components. Ecohealth approaches are described as "systemic, participatory approaches to understanding and promoting human health and wellbeing in the context of complex social and ecological interactions" (Waltner-Toews,2009). Integrating the ecohealth approach with ecosystem management benefits from a "co-benefit" or "double dividend", where action that addresses both biophysical and social environments has the potential to improve human health while promoting sustainable development (Bunch et al., 2011).

The principal research question of this work is "How do residents in the Credit River watershed perceive the ways that natural features and areas affect their social well-being?" The intent is to gain practical knowledge for environmental management and planners, and to generate recommendations for future research. To achieve these goals, this study will analyze survey responses related to social well-being and compare the neighbourhood characteristics of two study areas having different proportions of green space. The narrative from open-ended survey responses will be examined to pull out trends in how natural areas impact social well-being. These findings will be supplemented by statistical analysis of Likert scale responses tested against

demographic variables, neighbourhood characteristics, and the frequency of visits to various types of green space.

1.3 Methods

A 20 minute-long questionnaire to be delivered door-to-door was developed as part of the Watershed Well-being project. It was administered in two study areas of the Credit River watershed from October 2013 to January 2013, with an additional survey filled out in March of 2014 during a focus group session. Within the survey, two questions were designed with the intent of exploring how respondents perceived that natural features affect their social well-being. Quantitative results were analyzed with tests of associations against demographic variables and observations on the presence of natural features in respondents' front yards. Open-ended responses were grouped through inductive analyses allowing themes to emerge.

1.4 Organization of the this Major Research Paper

Following this introduction, a discussion on the geographical and political context of the Credit River watershed is presented in Chapter 2. Chapter 3 presents an overview of the literature relating the natural environment to social well-being and reviews relevant projects that have been developed to demonstrate this relationship locally. A discussion on human health and the state of the natural features in the two study areas is presented in Chapter 4. The methodology used to complement this data is included in Chapter 5, and the resulting findings in Chapter 6. Discussion of the results and conclusions are found in Chapter 7.

Chapter 2: Research Context

The intent of this chapter is to contextualize the discussion of health, well-being, and the environment in the Credit River Watershed. It situates the watershed and the Credit River Conservation Authority. It also summarizes the key land use planning, environmental, and public health plans and policies that frame the ecohealth issues of the watershed.

2.1 Geography

The Credit River Watershed covers an area of approximately 860 square kilometers with the Credit River's headwaters near the Town of Orangeville draining all the way to Lake Ontario (CVC, 2009). The upper portion of the watershed is mainly rural with the lower portions being heavily urbanized including the cities of Brampton and Mississauga (Ivey et al., 2004). The Credit River Watershed contains parts of 15 municipalities and regions in Ontario, with the majority located within the Regional Municipality of Peel (CVC, 2009).

The most significant landscape features in the watershed are the Niagara Escarpment, the Oak Ridges Moraine, and the Lake Ontario Shoreline. Other important moraines and smaller landforms are the Paris, Galt, and Singhampton Moraines as well as the Peel Plain and Iroquois Plain (CVC, 2009).

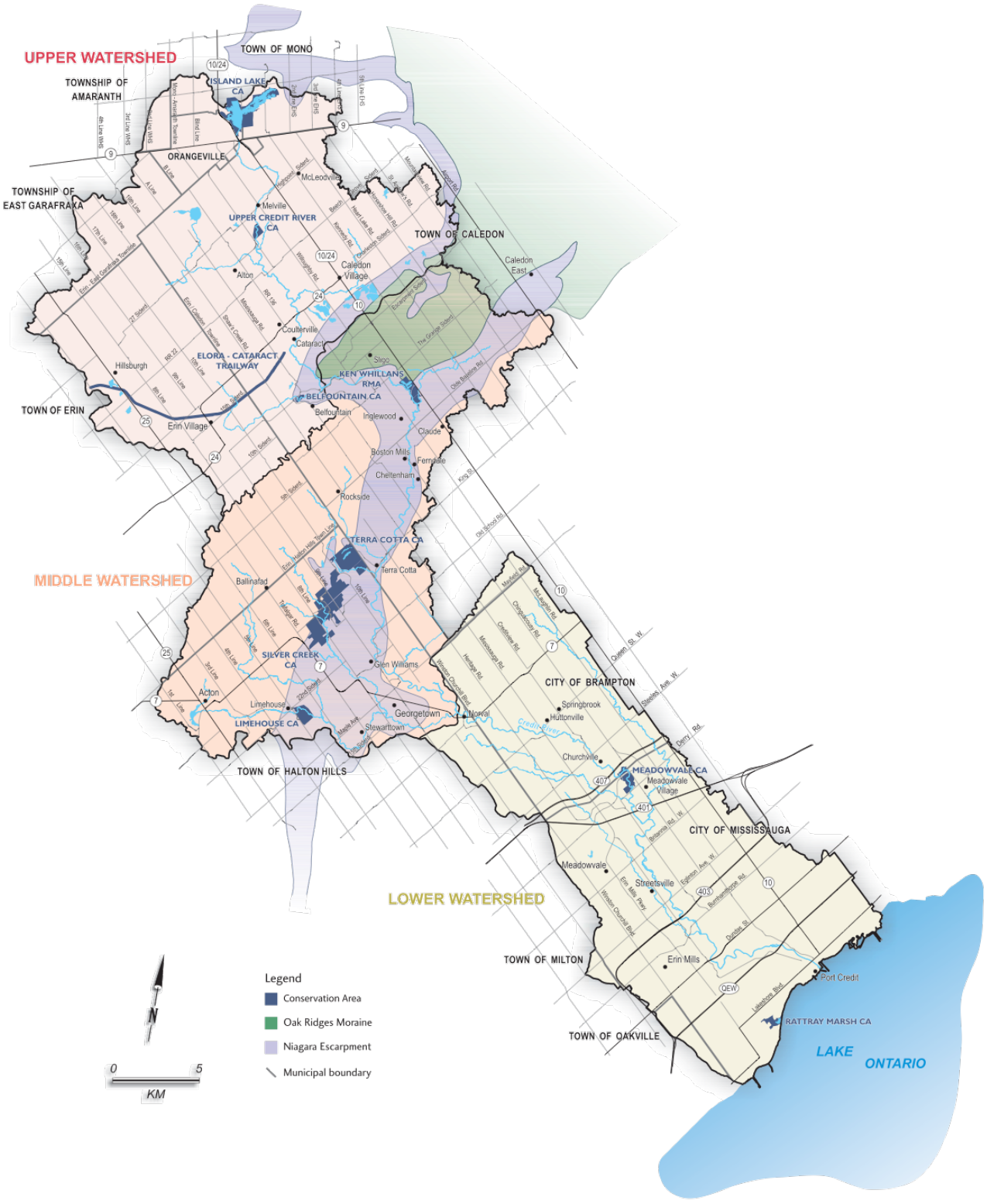


Figure 2-1 Map of the Credit River Watershed (CVC, 2011).

2.2 The role of Credit Valley Conservation

On May 13, 1954 Credit Valley Conservation (CVC) was formed as one of the 36 conservation authorities operating in Ontario to conserve, restore, develop, and manage natural resources on a watershed basis under the *Conservation Authorities Act* (1946). CVC's jurisdiction includes the Credit River, roughly 1,500 km of its tributaries, and the land that they drain (CVC, 2011). The majority of CVC's funding comes from its member municipalities: Region of Halton, Region of Peel, City of Brampton, City of Mississauga, Town of Caledon, Town of Erin, Town of Halton Hills, Town of Mono, Town of Oakville, Town of Orangeville, Township of Amaranth and Township of East Garafraxa, with other funds from user fees, a variety of donors and grants (CVC, 2014). CVC ranks among the most financially stable conservation authorities in the Province, arguably due to the significant amount of money devoted to planning and environmental services as "bedroom communities" to the City of Toronto (Ivey et al., 2004).

CVC's responsibilities are described as providing "planning and technical advice to planning authorities to assist them in fulfilling their responsibilities regarding natural hazards, natural heritage and other relevant policy areas pursuant to the Planning Act" (CVC, 2010). Its mandate includes goals addressing: 1) water quality, 2) water quantity, 3) terrestrial and aquatic species, communities, and ecosystems, 4) natural hazards, 5) social and economic factors. CVC's Strategic Plan (2006) elaborates on the latter, which is related to well-being.

> In addressing Social and Economic factors, CVC shall:
>
> - Demonstrate through research and identify and promote the community benefits of the watershed system (recreational, educational, cultural, psychological, tourism, economic).
> - Protect human physical, social and economic health as they relate to the natural environment.

- Provide appreciation and compatible recreational opportunities on protected land (CVC, 2006).

Fulfilling these goals, CVC has produced a report investigating the link between natural features and wellbeing: *Technical Report: The Importance of Ecosystem Services to Human Well-being in the Credit River Watershed* (2011). One of its recommendations for future research is to develop "an indicator-based framework to monitor and communicate the direct and indirect links between human well-being and environmental quality in the watershed" (CVC, 2011). Following this recommendation, CVC approached researchers at York University to collaborate on an exploration of environment-health relationships with an interactive web-based mapping tool that would communicate the links between well-being and the environment through the Watershed Well-being project.

2.3 Policy

2.3.1 Planning Act

The *Planning Act* sets out matters of provincial interest to which councils, local boards, planning boards, and the Municipal Board shall have regard (Planning Act, R.S.O. 1990). These matters include, among others, the protection of ecological systems, natural areas, features, and functions, as well as the protection of public health and safety. "The adequate provision and distribution of educational, health, social, cultural and recreational facilities" is also listed as important, though the term "facility" is not defined (Planning Act, R.S.O. 1990, s. 2 i). This paper argues that health and social services can be provided through access to and the improvement of the natural environment, viewing it as a valuable amenity or resource.

2.3.1.1 Provincial Policy Statement

Under the authority of section 3 of the *Planning Act*, the Provincial Policy Statement is issued by the Ministry of Municipal Affairs and Housing. It sets the policy foundation for regulating the

development and use of land in Ontario. Environmental health and social well-being are central to the 2014 Provincial Policy Statement (PPS). The concept of ecological goods and services are represented in the document's vision, where natural heritage resources are stated to provide important environmental, economic, and social benefits. A stance that resonates with ecohealth is demonstrated in the statement that:

> "Strong communities, a clean and healthy environment and a strong economy are inextricably linked. Long-term prosperity, human and environmental health and social well-being should take precedence over short-term considerations" (MMAH, 2014, part IV).

In the PPS, the three main policies of "Building Strong Healthy Communities", "Wise Use and Management of Resources", and "Protecting Public Health and Safety" are introduced with an emphasis on Ontario's long-term prosperity, environmental health, and social well-being. Environmental health and social well-being are recognized to be dependent on "conserving biodiversity, protecting the health of the Great Lakes, and protecting natural heritage, water, agricultural, mineral and cultural heritage and archaeological resources" (MMAH, 2014). Unfortunately, neither "environmental health" nor "social well-being" are included in the Definitions section. Municipalities may lack guidance in how to achieve the PPS's vision.

2.3.2 Special Protective Planning Policy

Over two decades ago, there was an emerging consensus that "land use planning does not always satisfactorily protect the environment, particularly from the negative cumulative environmental effects of changing land uses" (OMNR, 1993). Reports and recommendations began to push for the adoption of the ecosystem approach to natural resource management in Ontario, influences of which can be detected in the *Clean Water Act*, the *Oak Ridges Moraine Conservation Act* and the 1978 Canada-United States Great Lakes Water Quality Agreement (Tucker, 2010). In 1992, the

Royal Commission on the Future of Toronto's Waterfront released its report entitled *Regeneration* with the promise of "a healthy environment, economic recovery and sustainability, and maintaining a livable community" through the ecosystem approach (Royal Commission on the Future of the Toronto Waterfront, 1992, pp. 16–17). Environmentalists, academics, and politicians praised the influential report for its focus on understanding the interactions in ecosystems, its focus on diversity, environmental capacity, and its inclusionary mode of decision-making (Laidley, 2007).

The Credit Valley Watershed is subject to all of these laws mentioned above with sections of it located within the Niagara Escarpment, a small portion of the Oak Ridges moraine crossing its boundaries, and its tributaries draining into Lake Ontario. The Credit River Watershed therefore benefits from many forms of special protective planning law which address planning for human well-being and health in varying degrees. The *Conservation Authorities Act (CAA)*, *Niagara Escarpment Planning and Development Act (NEPDA), Oak Ridges Moraine Conservation Ac*t (ORMCA), and the *Greenbelt Act (GA)* all address recreation in natural settings, which is one way of ensuring residents' physical, mental, and social well-being. For the purposes of accomplishing its objectives, by the *CAA* a conservation authority has the power to use lands owned or controlled by it for park or recreational purposes. The *NEPDA* includes in its objectives the provision of adequate opportunities for outdoor recreation and the provision for adequate public access to the Niagara Escarpment; the objectives of the *Oak Ridges Moraine Conservation Act* include the provision of a continuous recreational trail and other public recreational access to the Area which are to be located in Countryside Areas; and an objective of the *GA* includes the provision of "open space and recreational, tourism and cultural heritage opportunities to support the social needs of a rapidly expanding and increasingly urbanized population" (*Greenbelt Act* , 2005, c. 1, s. 5. g). Numerous studies have demonstrated the health and well-being benefits of recreation in parks and green spaces (Bedimo-Rung et al., 2005). It is encouraging that recreation plays a role in the pieces of

legislation applicable to the Credit River Watershed and indirectly plans for well-being.

Nonetheless, the policy documents lack a focus on planning for cultural and social services, which would contribute to the social well-being of residents. The *CAA* does not focus on cultural or social services at all, though conservation authorities are not prevented from taking it on in their plans. Aside from providing a recreational trail and public recreational access, the *ORMCA* does not push for social services. "Cultural heritage opportunities to support social needs" (*Greenbelt Act* , 2005, c. 1, s. 5. g) is included in the objectives set out for the Greenbelt Plan in the *GA* through the idea is not expanded in the Plan.

Fortunately, the *NEPDA* does plan for cultural and social services. It includes in its objectives the protection of historic areas. Additionally, the Act provides guidelines for the contents of the Niagara Escarpment Plan, one of which is policy for the economic, social and physical development of the Niagara Escarpment Planning Area in respect of "the development and maintenance of educational, cultural, recreational, health and other social facilities" (*Niagara Escarpment Planning and Development Act*, 1990, s. 9 a vi).

2.3.3 CVC Watershed Planning and Regulation Policies

The CVC Watershed Planning and Regulation Policies document affirms that our "health depends on the health of the Credit River Watershed" and more generally that the state of human health is directly related to the health of our ecosystem (CVC, 2010, p. 5, p.9). In addressing its social and economic goals, CVC shall:

> a. Demonstrate through research and identify and promote the community benefits of the watershed system (recreational, educational, cultural, psychological, tourism, economic);
> b. Protect human physical, social and economic health as they relate to the natural environment (CVC 2010, pp.16).

CVC's mandate and its powers accorded through the *CAA* compel it to tackle human health and well-being through the route of managing its ecosystems. CVC is mainly required to restore or mitigate harm to its ecosystems by regulating development. The *CAA* states that the objectives of authorities are:

> to establish and undertake, in the area over which it has jurisdiction, a program designed to further the conservation, restoration, development and management of natural resources other than gas, oil, coal and minerals (*CAA,* R.S.O. 1990, C.27, s. 20.(1)).

An authority, as described in section 28(1), may regulate development:

> (c) prohibiting, regulating or requiring the permission of the authority for development if, in the opinion of the authority, the control of flooding, erosion, dynamic beaches or pollution or the conservation of land may be affected by the development (*CAA,* R.S.O. 1990, C.27, s.28(1))

This ensures that development will not occur if it will harm ecosystems. However, section 28(5) of the Act states that the Minister will not approve a regulation made under that clause unless it applies to areas that are:

> (a) adjacent or close to the shoreline of the Great Lakes-St. Lawrence River System or to inland lakes that may be affected by flooding, erosion or dynamic beach hazards;
> (b) river or stream valleys;
> (c) hazardous lands;
> (d) wetlands; or
> (e) other areas where, in the opinion of the Minister, development should be prohibited or regulated or should require the permission of the authority (*CAA,* R.S.O. 1990, C.27, s.28(5)).

Though this section ensures that sensitive areas, mainly aquatic ecosystems, are protected, it limits the abilities of Conservation Authorities to enforce their regulations. This provision may weaken their ability to protect diversity of interconnected habitats and of considering adjacent ecosystems that contribute to the integrity of the ones listed.

2.4 Planning for health and well-being in the Credit River Watershed

2.4.1 Ontario's Biodiversity Strategy

Ontario's Biodiversity Strategy emphasizes that: "our wealth and prosperity, our quality of life and our well-being are directly tied to the province's biological diversity" (Ontario Biodiversity Council, 2011, pp. i). It lists ecosystem services related to urban biodiversity including the temperature regulating ability of city trees, and flood prevention by urban creeks and rivers. The vision of the Strategy is a future where biodiversity losses are stopped and people value, protect, and enhance biodiversity essential to human health and well-being.

To help achieve this vision the Ontario Biodiversity Conservancy has established a target:

> "by 2015, 50 per cent of Ontarians understand biodiversity and its role in maintaining their health and well-being" with a key action of developing a strong network of partners engaged in acquiring a deeper understanding of the linkages between biodiversity and human health and well-being" (OBC, 2011, pp. iii).

Achieving this target will promote awareness of environment-well-being relationships. However, awareness doesn't always translate into action or sufficient support to alter the process of destructive urban development. Nonetheless, planning for well-being will certainly benefit from the biodiversity protection also targeted by the Ontario Biodiversity Strategy, an example of a "co-benefit" of such approaches.

2.4.2 Ontario's Public Health Sector Strategic Plan

Ontario's Public Health Sector has developed a Strategic Plan entitled "*Make no Little Plans"* to protect and promote the health of Ontarians through five strategic goals (Ontario Public Health, 2013). The fourth goal, "Promote healthy environments – both natural and built," recognizes the relationship of green space and health. It states: "green space […] can either foster or discourage good health" (pp. 20). Social well-being is also hinted at in the statement that the built environment affects safety and social connectivity which are key to community health (OPH, 2013).

A proposed action is enhancing "collaboration with municipal planners, transportation planners, public works, parks and recreation and others who influence the built environment" (OPH, 2013). This strategy is commendable as it recognizes the complex nature of socio-ecological issues and the integrated method needed to approach them. Overall, however, the natural environment is scarcely present in the document and may be forgotten in its other campaigns for optimizing healthy human development, immunization, physical activity and healthy eating, tobacco and alcohol, and information systems.

2.5 Summary

Though imperfect, the municipalities within the Credit River Watershed benefit from a range of plans and policies that respect environment and well-being relationships. The next chapter will explain the theories and studies that provide the evidence for these plans and policies. It will also give an overview of the local studies and projects that have emerged and been enabled by existing policies.

Chapter 3: Literature Review

The focus of this chapter is to define this work's key terms and situate it in regard to some related theories. The concept of social well-being will clarified and examples of how it relates to the natural environment will be presented. This section also contains an overview of the frameworks that tie social well-being to the natural environment as well as an outline of local studies focused on the well-being benefits of trees.

3.1 Social well-being

Well-being is broadly understood as happiness and prosperity, also described as having needs met, valued freedoms achieved, health, and the experience of a good quality of life (Coulthard et al., 2011). Well-being is likely to differ in various contexts depending on geography, society and culture with the idea of needs constructed by us and guided by the meanings with which we live our lives (Coulthard et al., 2011). Being closely related to health, various forms of well-being are listed in the recognized World Health Organization's (WHO) definition: "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 1948). Social well-being deals with the social characteristics of communities and neighbourhood, which are shown to be strongly associated with health (Sampson, 2003).

Corey Keyes, a leading researcher in social psychology, defines social well-being as "individuals' perceptions of the quality of their relationships with other people, their neighbourhoods, and their communities" (2006). Put more simply, it is known as "the appraisal of one's circumstance and functioning in society" (1998). Keyes suggests that social well-being is multidimensional, involving the extent to which people feel they have something in common with their neighbourhood and feel a sense of belonging (social integration); feel that they are valuable to their community (social contribution); feel that they can make sense of their social world (social coherence); feel that others

are capable of kindness and can be trusted (social acceptance); recognize potential and are hopeful for the future of their community (social actualization). A broad definition of "community" regards it as inclusive, based on faith, perspective, profession, as well as geographic lines (Norris & Pittman, 2000).

A wide range of publications supplements or combines the above list of dimensions with ideas of social ties (Kuo, 2003), friendliness, social cohesion, and social interaction (Forrest & Kearns, 2001), and social networks (Barton, 2009). The importance of place on the quality of social relationships is also described as place identity, a component of self-concept in relation to the place to which one belongs (Hernandez et al., 2010), and place attachment, a positive connection between a person and a place (Gosling & Williams, 2010).

Sense of community is also a component of social well-being which refers to residents' emotional bonding or ties to community (Carpiano & Hystad, 2011; Kim & Kaplan, 2004). It can be expressed in many ways such as sense of connectedness where residents feel attached to their community since it reminds them of their personal history, tradition, and familiar environmental characteristics (Kim & Kaplan, 2004).

Table 3.1 Theoretical Dimensions of Sense of Community. Adapted from Kim & Kaplan (2004)

	Domains of Sense of Community		
	Community Attachment	*Community Identity*	*Social Interaction*
Primary action	Bonding with community	Identifying (with) community	Being involved in community
Subcomponents	Community satisfaction Connectedness Sense of ownership Long-term local integration	Uniqueness Continuity Significance Congruence Cohesiveness	Neighbouring Casual social encounter Community participation Social support

Place and space is traditionally treated within urban planning and design, which connects to the well-being of communities. Planners and designers are recognized to have the power to design

physical settings that make people come together (Appleyard, Jacobs, & Bosselmman, 1982). Attention to public open spaces has highlighted that the optional and social activities occurring in urban areas are the most important keys to city quality (Gehl, 2004). A trend in planning for "livable communities" is increasingly making the link between a community's physical design and its impact on quality of life (Norris & Pittman, 2000).

The relationship between quality of life and well-being is not far-stretched, as demonstrated in the "Healthy Cities and Communities" movement spurred in part by the WHO and established in Canada with funding from Health and Welfare Canada in 1988 (Hancock, 1993). A "healthy city" has been defined as:

> "continually creating and improving those physical and social environments and strengthening those community resources which enable people to mutually support each other in performing all the functions of life and achieving their maximum potential" (Hancock, 1993).

The underlying principle of these planning and public health movements is that the physical and social contexts of a place interact to influence the well-being of its community. Well-being is also a process rather than a state, continually being improved and refined as the context changes.

The social context of well-being includes age, income, unemployment, education, gender, family, faith and church, friends and neighbours, community involvement, and trust, and many others (Helliwell & Putnam, 2004). Social well-being varies widely across communities according to their unique social characteristics of socioeconomic status, family structure, residential stability, and racial composition (Sampson, 2003). This follows the idea of "pluralist" societies where there is a diversity of ways of living everyday life and different values and cultures of interest exist (Jacobs & Appleyard, 1987; Healy, 1997).

To explain these heterogeneities, public health researchers have turned to the overlapping notion of social capital (Lochner et al., 1999). Social capital is essentially the resources embedded within social networks, norms, and trust facilitating co-ordination, co-operation, and individual or collective action (Putnam, 1993, p.35; Carpiano & Hystad, 2011). The domains of social capital include empowerment, participation, associational activity and common purpose, supporting networks and reciprocity, collective norms and values, trust, safety, and belonging (Forrest & Kearns, 2001).

In our changing world, social well-being across communities can be viewed as declining with friends and social neighbourhood ties less parochial and local (Sampson, 2003). This prediction of social cohesion in crisis rests on assumptions that the "social cement of a previous era is crumbling" and that past rules of social interaction are no longer applicable (Forrest & Kearns, 2001). Low-density development is often accused of discouraging interactions among residents, the strict separation of work, home and market deemed as "community-debilitating" (Williamson et al., 2005).

These assumptions fail to consider the subjective component of well-being. Belonging in a community composed of members from the same congregation may be socially beneficial for some, but not necessarily for all. Social interaction through social media is quite different from face-to-face interaction, but it is up to the individual to value the merits of each form and to determine what is most beneficial to his or her social well-being.

From a planning perspective, there is a need to avoid planning for a version of well-being presumed to be universal. The creation of spaces that are exclusionary in nature, limited to only a few forms of social interaction and designed only for a few social groups, should be avoided. There is also more

to well-being than the debate between single-use and mixed-use development. Though the physical context of a community is important, it should not be considered in isolation of other factors affecting well-being. From a policy perspective, the concept of social well-being and social capital must be broken down into manageable elements to move from abstraction to implementation (Forrest & Kearns, 2001). The long list of social well-being components and domains can probably be summarized into a few concepts that can be measured and monitored, such as sense of place and social interactions.

3.2 Frameworks connecting Social Well-being and the Environment

3.2.1 Millennium Ecosystem Assessment

The World Health Organization defines human health as a state of complete physical, mental and social well-being (1948). Social well-being has since been described and measured in many ways, such as social capital, social cohesion, sense of place, sense of safety, and social interaction. The Millennium Ecosystem Assessment (MEA) furthered the notion of well-being by linking it to environmental services. The MEA produced a conceptual framework describing the interrelationships between ecosystem services and key aspects of human well-being, notably "good social relations." Descriptors of good social relations are:

- Opportunity to express aesthetic and recreational values associated with ecosystems
- Opportunity to express cultural and spiritual values associated with ecosystems
- Opportunity to observe, study, and learn about ecosystems (MEA, 2003)

Though the framework is useful to advance our understanding of the relationships between the natural environment and people, it is criticized for insufficiently elaborating on the ways that social well-being is supported by ecosystem services. There is a lack of research on the social well-being benefits of green spaces and a need to distinguish the benefits of different types of green spaces for different groups of the population at various levels of exposure (Newton, 2007).

3.2.2 Ecohealth

At the core of ecohealth, or ecosystem approaches to health, is the fundamental idea that "human health depends on healthy environments, and human prosperity depends on both healthy people and ecosystems in good condition" (Charron, 2012). Therefore, when ecosystem management is effective, it will result in improved human health and well-being (Bunch et al., 2011). An ecohealth approach to ecosystem management, planning, or decision-making will draw on anthropology, epidemiology, public health science, geography, and systems ecology to study the interactions between the natural environment and health and well-being (Bunch et al., 2011). In addition to transdisciplinary research, systems thinking and public participation principles are used to address sustainability, gender and social equity, and knowledge to action (Charron, 2012). To tie it all together, ecohealth is about:

> "Recognizing that health is contingent on biophysical, social, economic and political environments (justice and sustainability) necessitates an approach that transcends disciplines (transdisciplinarity), takes into account various perspectives (multi-stakeholder participation) and is aware of systemic inequities and difference (social and gender equity)" (Webb et al., 2010).

3.2.3 Watershed Planning

In the planning and management context, the river basin or watershed is usefully employed as an organizing principle (Hodge & Gordon, 2008, pp. 168). The idea of watersheds as appropriate units for resource planning and management dates back to the 1800s (Blomquist & Schlager, 2005, p. 102). Policy prescribes that "since political boundaries almost never correspond with watersheds and watershed-scale decision making structures do not usually exist, they should be created" (Blomquist & Schlager, 2005, pp. 101).

Watershed planning steers away from isolating problems by taking into consideration the flow and travel of water and water's interaction with the land. However, watershed management initiatives

‘‘face numerous obstacles, more social than hydrologic’’ (Blomquist & Schlager, 2005, pp. 102). Not only is a high degree of political commitment and federal resources key to their success, but also community participation is essential to watershed management. A bottom-up approach involving local communities and regions contributes to long-term success (McGinnis et al., 1999, pp. 10).

3.2.4 Integrated Watershed Resource Management

Integrated Watershed Resource Management (IWRM) furthers a view of health-water relationships that adds livelihoods, employment, food and service provisions, culture and identity, to the traditional focus of drinking water supply, sanitation, and contaminants (Bunch et al., 2011). The examination of water resources is an opportunity to determine relationships between health and sustainable development.

The *integration* of water resource management implies the adoption of a more comprehensive approach that combines supply allocation, demand management, quality protection, and ecological preservation or restoration (Blomquist et al., 2007, p. 299). IWRM is defined as:

> “a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.” (Bunch et al, 2011).

IWRM should meet human requirements of freshwater while maintaining hydrological and biological processes (Jewitt, 2002).

With its potential to enhance sustainable livelihoods, IWRM can serve as a venue for public engagement and a buffer for poverty. Local communities can be empowered through participatory watershed management approaches that create watershed councils, create programs that works with communities to respond do their interests, provide leadership training and create structural and institutional conditions that can lead to early successes (Bunch et al., 2011).

The outcomes of effective ecosystem management such as IWRM are human health and well-being (Bunch et al., 2011). The notions of environmental goods and services are perceived as social benefits, which are directly related to the ecological integrity of the ecosystems that provide benefits. Moreno explains: "the more deteriorated these functions are, the more the well being of the population tends to deteriorate "(2006, p. 436). It is essential for IWRM to consider its effects on ecosystems as well as the people that interact with them.

3.3 Evidence of relationships between natural features and social well-being

3.3.1 Trees

The natural feature that has most extensively been tied to health and well-being benefits are trees. Urban trees have been shown to foster place attachment in people by providing significant emotional and spiritual experiences (Nowak & Dwyer, 2007). Urban trees also contribute to increased neighbourly interactions and help strengthen social ties (Nowak & Dwyer, 2007; Kuo, 2003). Individuals living in greener environments reported being more concerned with helping and supporting their neighbours (Kuo, 2003).

Percent canopy cover of urban areas present on residential land are related to variables such as neighbourhood age, socioeconomic status, and ethnic composition of residents (Conway & Shakeel, 2012). The greatest opportunity to increase total municipal tree cover is also found in the residential low land use category (TRCA, 2011). Unfortunately, though residents have been shown to appreciate the environmental benefits that trees can provide, they show weak support for municipal urban forest policies (Conway & Shakeel, 2012). There is little research that explains this attitude or how to influence it, though it has been suggested that residents simply prefer having

control over the trees on their properties (Conway & Shakeel, 2012). An ecohealth approach to policy may be needed to increase tree canopy.

3.3.2 Green space

Green space is strongly related to general well-being and happiness, and usually found to facilitate social cohesion (Kawachi and Berkam, 2000; Ellaway et al., 2001; Kim and Kawachi, 2006; Echeverria et al., 2008; Van Herzele & de Vries, 2012). Studies in Chicago have also demonstrated that urban green space provides spaces for people to come together (Kuo et al., 1998, Kuo, 2003). A study focused on children in Zurich found that urban green spaces play an important role in making contacts and friends across cultures, which is considered to be a prerequisite for social inclusion (Seeland et al., 2009).

Dutch living in an environment with a greater percentage of green areas were found to feel less lonely even if they do not have more contact with neighbours or friends in the neighbourhood (Maas et al., 2009). Also in the Netherlands, a study suggests that green spaces facilitate social contact (Peters et al., 2009) though it is accused of lacking scientific rigour since it relied on observations and self-reporting (Region of Peel, 2014a).

The mechanisms for how green spaces contribute to improved social cohesion and stronger communities remain unknown (Region of Peel, 2014a). It is also unclear to what degree this research is transferable beyond the study areas (Region of Peel, 2014a).

3.4 Local Reports

3.4.1 Credit Valley Conservation

CVC has produced a report entitled: "The Importance of Ecosystem Services to Human Well-Being in the Credit River Watershed" (CVC, 2011) which found that residents consider ecosystem services an essential contributor to their well-being. The most common natural features considered by residents to provide ecosystem services were trees, water, scenery, and wetlands. Interestingly, the linkages between the natural environment and well-being were made regardless of whether or not residents actually used the natural areas frequently.

Many of the benefits of these natural features relate to social well-being. 71.5% of respondents indicated community belonging or a sense of place as one of the strongest links between well-being and natural areas. However, less than half of respondents were satisfied with the quality and ability of natural areas to provide this service.

The study also highlighted the role the environment can play in contributing to social cohesion by examining respondents' willingness to contribute to bettering the watershed (CVC, 2011). 36.6% of respondents said they would volunteer time to help with community restoration projects, 34.0% of participants said they would be willing to restore natural area on their property, and 23.7% said they would donate money to conservation organizations. These levels of willingness could be used as an indicator of social well-being since it increases with closeness to nature or place and is directly related to how much a person trusts in their community (Gosling & Williams, 2010; Amsden & VanWynsberge, 2005)

The report also included a proposed indicator framework, including some indicators for the domain of good social relations, which is a component of social well-being. Example indicators include a

recreational index of natural areas, an aesthetic index by subwatershed, use of natural areas for cultural and spiritual activities, use of green space for social functions, and availability of natural areas. The latter is explained to promote social relations "as natural areas become an environment for people to learn more about nature and about each other" (CVC, 2011, pp.37).

3.4.2 Local Tree Studies

3.4.2.1 Forest Study Technical Reports, Cities of Mississauga and Brampton

Forest Study Technical Reports were produced for both the City of Mississauga and the City of Brampton (2011) with recommendations for strategic plantings and management that enhance the sustainability of both the urban forest and the community as a whole. These reports discuss the ecosystem services of the urban forest specific to social and mental health. Management for well-being is considered more of a side-effect of managing the urban forest rather than a major goal considering that the list of recommendations are focused mainly on urban forest resilience and biodiversity.

The reports nonetheless include an interesting literature review with examples such as trees reducing crime by soothing violent temperaments and by increasing surveillance on the streets as people tend to use treed spaces more than treeless spaces (Eastwood, 2011). It has also been shown that residential common areas with trees can help build strong neighbourhoods as respondents reported knowing their neighbours better, socializing with them more often, having stronger feelings of community, and feeling safer and better adjusted than residents of more barren neighbourhoods (Eastwood, 2011).

3.4.2.2 Region of Peel Priority Tree Planting Areas

The Region of Peel is undertaking a Priority Tree Planting project to develop a map-based tool that will "help identify potential areas for tree planting based on environmental and/or economic and/or social (including human health) considerations" (Region of Peel, 2014a). It has produced a discussion paper that summarizes urban forest functions and the benefits and evidence found in the literature. It also included the strength of evidence found, indicating that reduced incidence and crime, increased social cohesion, and place-attachment related to forest functions are weakly demonstrated in the literature (Region of Peel, 2014a).

Table 3.2 Summary of urban forest functions/benefits and evidence in the literature. Adapted from Region of Peel, 2014a.

Urban forest social functions/benefits	Strength of evidence in the literature
Improved physiological health	Moderate to strong evidence
Improved psychological health and cognitive functioning	Moderate to strong evidence
Reduced incidence in crime	Weak evidence
Increased social cohesion	Weak evidence
Place-attachment	Weak evidence

3.4.2.3 Trees and Residents Study, University of Toronto

In 2012, a research team from the Department of Geography at the University of Toronto, Mississauga, produced a paper exploring residents' role in the city's urban forest (Conway & Shakeel, 2012). Recognizing that urban forests provide ecosystem services important for well-being and that the distribution of the urban forest in Mississauga is uneven, researchers were looking to understand patterns at the property-level. This scale is significant because it is where residents make decisions, the cumulative impact of which shapes the characteristics of the urban forest.

One of the study's findings is that if people have a positive attitude towards trees, they are more likely to plant and care for them (Conway & Shakeel, 2012). In consequence, they are more likely to enjoy the well-being benefits that the trees provide. This finding supports the objective of creating

indicators of well-being to foster positive attitudes towards natural features and areas. The study's methodology also inspired this study's design in the selection of study neighbourhoods and survey data to collect.

3.4.2.4 Healthy Dose of Green, Trees Ontario

Trees Ontario, a not-for-profit tree planting partnership, is concerned with the current percent forest cover in Ontario that is compromising the health of ecosystems and their inhabitants. They are very explicit in describing the health-environment relationship:

> "Our health and well-being are intricately interconnected with the health of our natural environment. Trees and forests are integral components of healthy ecosystems that support healthy human populations"
> (Trees Ontario, 2012, pp. 4).

The *A Healthy Dose of Green: A Prescription for a Healthy Populatio*n report further highlights the links between human health and the health of forests by compiling relevant findings from a range of sources to aid them in advocating for an intensification of tree planting efforts. The research findings summarized in the report mostly have to do with physical health: promotion of physical activity, cardiovascular and respiratory diseases, diabetes, cancer, attention deficit, and stress (Trees Ontario, 2012). The choice of examples reported demonstrates the need for awareness of a broader definition of well-being and more research on the effects of trees on community bonds and social interaction.

3.5 Summary

Social well-being is related to the natural environment in many ways and strengths. This work will supplement the body of evidence that currently relates the natural environment to social well-being. In addition to studying the effects of trees and green space, it will also examine the effects of streams and rivers and of green spaces that are specified according to their natural features and functions. It will provide additional local urban examples that are more relevant to southern

Ontario than examples from the States, Germany, or the Netherlands. The following chapter will describe in detail the urban areas being studied.

Chapter 4: Study Areas

The study area includes two neighbourhoods located within the lower-tier municipalities of Mississauga and Brampton, which belong to the Region of Peel. Their boundary, demographics, and natural features will be described. A brief overview of each municipality's planning documents will also be presented with a focus on ecohealth.

4.1 Boundary of study areas

Two contiguous dissemination areas delineated by Census Canada originally defined both neighbourhoods, which are referred to as Meadowvale and Fletcher's Creek. Dissemination areas have a population of approximately 500 people and are based on the area that can be canvassed by one Census Enumerator (Region of Peel, 2014). As the surveying the survey process advanced, certain streets and sections of the dissemination areas were eliminated where there was no response rate.

The Credit River Watershed has three distinct physical regions referred to as the upper, middle and lower watershed. The study sites for this research are located in the latter, which is characterized by a relatively flat surface topography gently sloping towards Lake Ontario (CVC, 2011). The area is highly urbanized, with a decadal rate of increase of urbanization of over 26% and many of its tributaries channelized or enclosed (CVC, 2011; CVC, 2006).

4.2 Meadowvale, Mississauga

Figure 4.1 Outline of the Meadowvale neighbourhood. Adapted from a map prepared by Kamal Paudel, CVC, 2014.

The Meadowvale neighbourhood is located in Mississauga, Ontario, a city with a population of 713,443 (Conway & Shakeel, 2012). Mississauga is located just west of Toronto with Lake Ontario forming its southern border. The city is characterized by a mix of residential neighborhoods, shopping complexes, employment centers, industrial areas, and historic town centers (Conway & Shakeel, 2012).

Meadowvale is a newer, high-income neighbourhood with an old settlement named Meadowvale Village at its edge. The Meadowvale Conservation Area is within walking distance of most residents

and is traversed by the Credit River. The majority of houses in the newer section of the neighborhood have small trees, mostly limited to the front of the house (Conway & Shakeel, 2012).

Figure 4.2 View of a typical street in the newer section of Meadwovale, Mississauga (Mallette, 2013).

Figure 4.3 Streetscape in Meadowvale Village, Mississauga (Mallette, 2013).

4.3 Fletcher's Creek, Brampton

Figure 4.4 Outline of the Fletcher's Creek neighbourhood. Adapted from a map prepared by Kamal Paudel, CVC, 2014.

The second case study area is located in Brampton, a city with a population of over 523, 911 in 2011 (Brampton, 2014). It's located about 45 kilometers from downtown Toronto and is north of Mississauga. The city is experiencing a high growth rate since it continues to have a supply of developable land within its municipal boundaries while the City of Mississauga's greenfields are just about developed (Brampton, 2006).

The case study area is named after the watercourse that runs through it: Fletcher's Creek. The watercourse separates an older section of the neighbourhood to the east from the newer development to the west though the dates of construction were not found.

Figure 4.5 Streetscape of the newer section of Fletcher's Creek, Brampton (Mallette, 2013).

Figure 4.6 View from a resident's front porch in the older section Fletcher's Creek, Brampton (Mallette, 2013).

4.4 Demographics

Poverty is generally defined as persistent low income experienced by people who have difficulty changing their circumstances (Region of Peel, 2010). Low and very low-income can be defined as less than 40% of the average individual income (Neighbourhood Change Partnership, 2010). Impacts of chronic poverty include poor access to nutritious food, higher odds of premature birth, higher odds of low birth weight babies, lower levels of self-rated health and higher levels of distress (Region of Peel, 2010). Peel Region's poverty rate of 15% in 2006 was slightly higher than the provincial rate (Region of Peel, 2010). Brampton likely experiences higher poverty rates than Mississauga, with 65.2% low and very low-income census tracts in 2010 compared to 37.6% (Neighbourhood Change Partership, 2010).

Table 4.1 Income measures by municipality.

	Peel Region	Mississauga	Brampton
Median after-tax income for population aged 15 years and older in 2011 (Peel Public Health, 2013)	$27,241	$27,508	$26,272
Average after-tax income for population aged 15 years and older in 2011 (Peel Public Health, 2013)	$33,232	$34,442	$30,548
Percent low and very low-income census tracts in 2010 (Neighbourhood Change Partnership, 2010)	45%	37.6%	65.2%

Compared to Mississauga at 44.4% and the province of Ontario at 33.4%, Brampton also has a lower percentage of university graduates with 31.1% of the population aged 25-64 holding a university certificate, diploma or degree in 2011 (Peel Public Health, 2013a).

Table 4.2 Using university graduation as the highest level of education achieved as an indicator of education levels at different scales.

	Ontario	Credit River Watershed	Peel Region	Mississauga	Brampton
University graduation rates	33.4% of population aged 25-64 years hold a university certificate, diploma or degree in 2011 (Peel Public Health, 2013a)	24.4% of population hold a university undergraduate degree (Bachelor's) based on the 2006 census estimates (CVC, 2011).	38.5% of population aged 25-64 years hold a university certificate, diploma or degree in 2011 (Peel Public Health, 2013a)	44.4% of population aged 25-64 years hold a university certificate, diploma or degree in 2011 (Peel Public Health, 2013a)	31.1% of population aged 25-64 years hold a university certificate, diploma or degree in 2011 (Peel Public Health, 2013a)

4.5 Ecological health and presence of natural features

Land use change is the most important influencing factor of the Credit River Watershed's natural heritage system (CVC, 2013). Depending on the context, land use affects surface water chemistry and urban forest conditions. The natural heritage system Fletcher's Creek appears to be under greater stress than in Meadowvale. See Table 4.3 for a comparison of selected natural heritage parameters for the two study areas.

Table 4.3 Surface water quality and forest conditions reported in the 2013 Credit River Watershed Report Card (CVC, 2013).

	Fletcher's Creek Subwatershed	Credit River: Norval to Port Credit Subwatershed
Associated Study Area	Fletcher's Creek, Brampton	Meadowvale, Mississauga
Surface water quality	Very poor	Fair
Forest conditions	Very poor	Poor

When examining the different types of green space and amenities present in each study area, Meadowvale has a greater length of trails and percent area of parkland and woodland. On the other hand, Fletcher's Creek has longer waterways and a greater total number of functional green space within a 3 kilometer radius.

Table 4.4 Length and area of features in each study area. Prepared by Mitch Harrow (2014; 2014a; 2014b; 2014c).

Natural areas or features	Fletcher's Creek, Brampton	Meadowvale, Mississauga
Trails (m)	642.75	3,875.32
Parks (m^2)	20,133.22	262,564.70
Woodland (m^2)	28290.79915	127756.5358
Waterways (m)	5,972.90	3,370.78

Table 4.5 Percent parkland and woodland by study area. Prepared by Mitch Harrow (2014a; 2014b)

Land type	Fletcher's Creek, Brampton	Meadowvale, Mississauga
Percent Parkland	4.0%	24.7%
Percent NAC Woodland	0.4%	1.7%
Percent Core Woodland	5.2%	10.3%

Table 4.6 Number of functional green spaces within 3 kilometers of the study areas. Prepared by Mitch Harrow (2014d; 2014e).

Functional green spaces	Fletcher's Creek, Brampton	Meadowvale, Mississauga
Cemeteries	2	3
Schools	34	17
Hospitals	1	0
Golf courses	0	3
Playing fields	66	38
Total:	103	61

4.6 Human health and well-being

Reports on human health and well-being of residents living in the Credit River watershed differ in indicators and in the scale at which they were measured.

4.6.1.1 Ontario

The state of Ontarians' health is considered to be among the best in the world and is still improving despite self-reported health decreasing and rates of diabetes increasing (CIW, 2014). Ontarians can generally benefit from good educational opportunities and community involvement, but are ambivalent about democracy and are living through a period of rising income inequality (CIW, 2014). They also live in a deteriorating natural environment and have little access to the ecosystem services that it provides. They are socializing less, spending less time for arts, culture, and

recreation, and are working long hours with longer commutes (CIW, 2014). All things considered, the Canadian Index of Wellbeing reports an increasing trend in Ontarians' overall well-being (CIW, 2014).

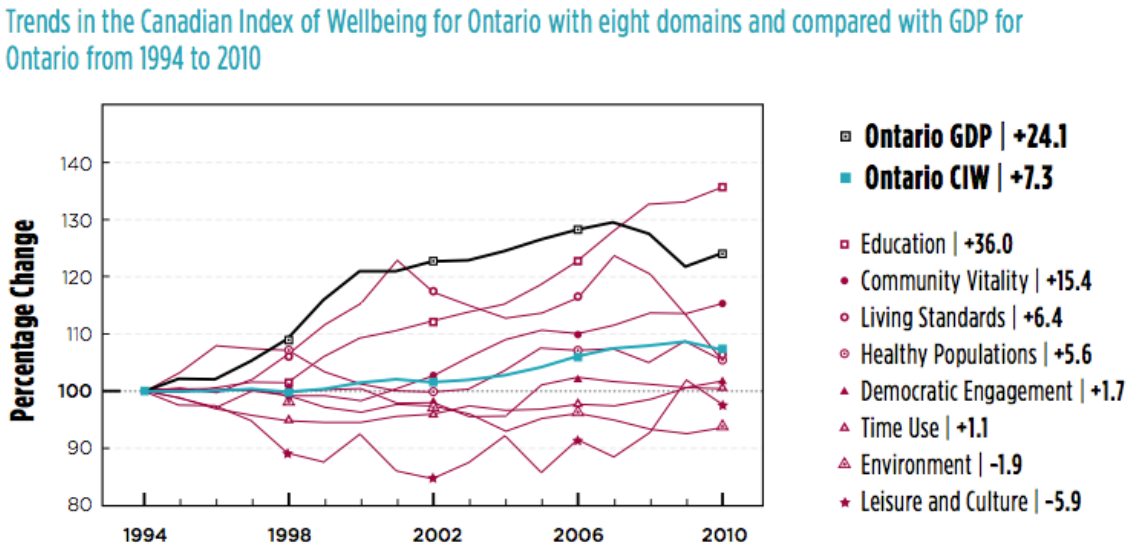


Figure 4.7 Representation of the contradicting health and well-being trends for Ontario reported by the Canadian Index of Wellbeing (2014). Overall well-being is reported to have been increasing since 1994 (shown by the blue line).

4.6.1.2 Region of Peel

In 2005, the Region of Peel's rates of obesity and chronic disease were alarmingly high with 47% of adults either overweight or obese, and 9% suffering from diabetes (Dunn et al., 2009). The region has some of the lowest active transportation rates in Canada and in 2003, 54% of Peel adults were inactive, meaning that they accumulated less than 150 minutes of moderate-to-vigorous-intensity aerobic physical activity per week (Dunn et al., 2009; Region of Peel, 2014b). 70.6% of Public Health survey respondents had used either a walking, biking, or nature trails in the past year prior to the survey (Peel Public Health, 2012a). Despite the statistics presented above, a respectable 90.3% of Peel residents considered themselves as having good, very good, or excellent health in 2011/2012(Peel Public Health, 2014).

Table 4.7 Indicators of Peel Region public health.

Health indicators	Ontario	Peel
Percent of population who rated their health as excellent, very good, or good in 2011/2012 (Peel Public Health, 2014)	88.7%	90.3%
Percent of population who reported a very or somewhat strong sense of community belonging in 2011/2012 (Peel Public Health, 2014a)	67.6%	65.6%
Percent of population who have diabetes in 2009/2010 (Peel Public Health, 2012)	6.9%	7.3%

4.7 Presence of ecohealth in policy and planning documents

4.7.1 Peel Region Official Plan

The purposes of the *Peel Region Official Plan* explicitly include "health and safety." The plan recognizes the interrelationships between the environmental and social aspects of its jurisdiction in its goal to "provide a holistic approach to planning through an overarching sustainable development framework that integrates environmental, social, economic and cultural imperatives" (Region of Peel, 2013).

One of the Plan's overall goals is to create healthy communities, which are described with all sorts of well-being and the preservation of natural heritage:

> 1.3.6.1. To create healthy and sustainable regional communities for those living and working in *Peel* which is characterized by physical, mental, economic and social well-being; minimized crime, hunger and homelessness; a recognition and preservation of *the region*'s natural and cultural heritage; and an emphasis on the importance of *Peel*'s future as a caring *community* (Region of Peel, 2013).

The term "healthy communities" is further defined in the glossary, where a broad definition of health is offered. The definition offers guidance for decision-makers in the region with bullet points that could easily be transformed into targets.

Definition of "healthy communities" from the Peel Region Official Plan (2013).

Healthy communities: a broad and inclusive definition of health which refers to not merely the absence of disease, but also complete physical, mental and social well-being. This is a pro-active model of wellness incorporating a person's perceptions of their quality of life, their chances for optimal social interaction, the availability of *community* activities and resources, and a monitoring of the link between daily stress and health. A *healthy community* is characterized by:

- a clean, safe, high quality physical environment;
- a stable *ecosystem* that is moving towards sustainability;
- a strong, mutually supportive and non-exploitative *community*;
- a high degree of participation and control by the public over decisions affecting their lives, health and well being;
- the meeting of basic needs for food, water, shelter, income, security and work for all the people of the *community*;
- access to a wide variety of experiences and resources, with the chance for a wide variety of contact, interaction and communication;
- a diverse, vital and innovative economy;
- connectedness with the past and with the cultural and biological heritage of the *community*, groups and individuals;
- a form that is compatible with and enhances the preceding characteristics;
- an optimum level of appropriate health and sick care *services* available to all; and
- high levels of positive health and low levels of disease.

4.7.2 City of Mississauga

The *City of Mississauga Strategic Plan* contains five Strategic Pillars for Change, three of which are related to health and one to the environment. The principles include promoting healthy lifestyles through transit with a goal of developing environmental responsibility, and supporting a "rich, healthy, and prosperous social and cultural mosaic" through active transportation. The Living Green pillar also suggests enhancing natural areas, protecting forests and valleys and connecting people to the Lake Ontario waterfront "so that future generations enjoy a clean, healthy lifestyle." The strategic goals include leading and encouraging environmentally responsible approaches; conserving, enhancing and connecting (City of Mississauga, 2013).

The thirteen members of the Healthy City Stewardship Centre (HCSC) including the City of Mississauga, Credit Valley hospital, Region of Peel, Trillium Health Centre and others, have collaborated to produce the *Healthy Mississauga 2010 Plan*. According to these members,

Mississauga is considered to be generally in a favourable health condition, but with concerns for growing trends of obesity rates, poverty levels, and others (HCSC, 2010).

The Plan's principal vision is that "Mississauga will be a Healthy City of people with optimal physical, mental and spiritual health" though social and environmental health is also discussed (HCSC, 2010). The document revolves around the following goals with several champions and targets:

- All people in Mississauga will value and strive for optimal health.
- All people in Mississauga will feel safe in their communities.
- All people in Mississauga will have equal access to information and services.
- All people in Mississauga will live in and contribute to a clean and sustainable environment.
- All people in Mississauga will feel part of a larger community and will know that they will be cared for in times of need.

The HCSC also produced Report Cards giving an update on the health related projects that had been initiated throughout the year under the following themes that echo the principles of ecohealth: optimal health, feeling safe, access to information, sustainable environment, caring community (HCSC, 2010a).

4.7.3 City of Brampton

The *City of Brampton Official Plan* strongly relates health to natural heritage systems in its environmental goals with the motto "protecting our environment, enhancing our neighbourhoods." It explains that "public health and safety are fundamentally linked to environmental health," and that "the natural heritage system is integral to the health of the City, its neighbourhoods and its residents, and should be protected, as identified in these policies, subwatershed studies and block plans" (City of Brampton, 2013). It emphasizes using the ecosystem approach to land use planning to "protect and enhance environmental and public health and improve the overall quality of life for residents" (City of Brampton, 2013).

"Healthy communities" are often characterized by transit and walkability similar to the City of Mississauga's Plan. A healthy community is further described to be a benefit of ecological goods and services from functioning diverse ecosystems. The City recognizes that "healthy, sustainable communities integrate natural systems that provide for an accessible parks and recreation system that is based within a cohesive and comprehensive natural heritage system" (City of Brampton, 2013).

Chapter 5: Methodology

A survey instrument is the main approach used to answer this research's main question: "how do residents in the Credit River watershed perceive the ways that natural features and areas affect their social well-being?" By using open-ended questions to ask residents of selected study areas *how* their local natural environment is linked to their well-being and *why* outdoor spaces are important to their social well-being we are able to tease out the ways in which natural areas and features affect their well-being.

Another strategy consisted of boiling down social well-being into its dimensions of sense of place, social interactions, and social cohesion by creating a set of statements which respondents rated on a five point scale. These statements incorporate the influence of neighbourhood natural features and areas with the explicit example of "trees, shrubs, flowers and green space" affecting a certain aspect of social well-being. With the grading exercise consisting of scale of "Strongly Agree" to "Strongly Disagree," the results are interpreted as how strongly respondents perceive the environment-well-being relationship and which specific links are more readily recognized. Associating these statements with physical data such as percent tree canopy and distance to green space gives additional insight into the neighbourhood conditions that affect the perceived links between social well-being and the natural environment.

Statistical analysis to test the strength of association between demographic variables and survey questions was also achieved to gain an understanding of what household characteristics influence the social well-being and natural environment link perception. The use of two study areas also enables a comparison of the neighbourhood and environmental attributes that affect respondent's perception.

5.1 Study area selection

Initial site selection was based on a previous study "Trees and Residents: An exploration of residents' role in growing Mississauga's urban forest" (Conway & Shakeel, 2012) which included the Meadowvale neighbourhood. Meadowvale as an affluent neighbourhood with good access to a conservation area was hypothesized to provide an example of where environment and well-being relationships would be strongly recognized. Its close location to the CVC's main office is also convenient for surveyors that would be departing from the office.

The research team later rejected the three other areas from the Conway & Shakeel study. A site visit revealed one of the neighbourhoods to be too dissimilar for comparison since it was predominantly row housing while Meadowvale is composed of completely detached homes. Another neighbourhood was deemed too sensitive to survey by CVC because of a recent flooding event. The remaining neighbourhood would not yield interesting results since it did not contrast much with Meadowvale.

The second case study for this research was at first considered because it is targeted for a Sustainable Neighbourhood Action Plan by CVC, which could be informed by the results of the survey. Fletcher's Creek in Brampton was chosen because its income levels and age of infrastructure differed from Meadowvale but it still possessed a water feature and parks within walking distance, which would allow for comparisons during analysis.

5.1.1 Representative samples

The number of total households within each study area was determined by counting the building envelopes represented on the City of Brampton's online mapping system (2014) and confirming the numbers by counting rooftops with Google satellite imagery. The calculated representative sample size n and margin of error E are given by the following equations using the online Raosoft Sample Size Calculator (2004):

[1] $$x = Z\left(\frac{c}{100}\right)^2 r\,(100 - r)$$

[2] $$n = \frac{N\,x}{((N-1)E^2 + x)}$$

[3] $$E = \sqrt{\frac{(N-n)x}{n(N-1)}}$$

Table 5.1 Calculated sample size for each study area.

	Fletcher's Creek, Brampton	Meadowvale, Mississauga
Number of households in study area	159	218
Confidence level of sample	90%	90%
Margin of error	10%	10%
Calculated sample size	48	52

5.2 Survey instrument

The idea of a survey instrument emerged out of recommendations from consultants for future research on human well-being in the Credit River Watershed to "develop an indicator-based framework to monitor and communicate the direct and indirect links between human well=being and environmental quality in the watershed" (CVC, 2011). Heeding these recommendations and in an attempt to make this project a bottom-up participatory process, direct input from local residents was proposed to be collected through small-scale surveys and focus groups with watershed residents (Koveshnikova, 2013). Following a research team meeting in July of 2013, myself and another graduate student, Alexandra Belaskie, formulated the first draft of the survey. A process of multiple revisions and testing with friends, family, and colleagues led to the final survey version to be completed in October of 2013.

Structured interviews were conducted door-to-door with 107 residents, 50 in the City of Brampton, and 57 in the City of Mississauga. A mix of closed-ended and open-ended questions explored different aspects of well-being. Many responses were made on a five-point Likert scale from

"strongly agree to strongly disagree," "very important to not important at all," and "at high risk to not at risk at all." Six statements of social well-being explored sense of place, social interactions, and social cohesion based on the stem question "to what extent do you agree with the following statements about your well-being as it relates to your neighbourhood environment?" These statements and other survey questions were based on a literature review of measures of social well-being summarized in Table 5.2.

The in-person method of delivery was chosen for the survey with the hopes of achieving high response rates. This expectation was based on previous studies conducted by CVC where in-person surveys yielded a higher response rate than online (see Table 5.4). A few weeks into surveying the response rates were sufficiently demoralizing to prompt surveyors to drop off paper version of the surveys for respondents to fill out in their own time, which they would collect later. Five surveys were collected in this manner, with an additional one completed outside of our surveying period at the end of March during a focus group session associated with the project.

Table 5.2 Measures of social well-being.

Aspect of Well-being	Questions
Sense of safety	How safe do you feel living here? (Kuo et al., 1998)
Sense of Adjustment	How well have you adjusted to living here? (Kuo et al., 1998)
Neighbourly and visitor relationships	Do you have many visitors every day? Do you socialize a lot within the building? How well do you know the people next door? How well do you know the people on your floor? (Kuo et al., 1998)
Social benefits of an area	To what extent do you agree with the following statements about your neighbourhood? It contributes to the local economy It's a place where people can relax and de-stress It's a place where people can exercise and keep fit It's a place where people can have fun and enjoy themselves It's a good place to socialize It's a place where people can learn about the environment It's an important place for wildlife It brings the community together It makes this area a nicer place to live It gets people involved in local issues It's a place where I feel at home (Morris & Doick, 2009)
Social networks	Are you content with the number of close friends you have? Do you have many acquaintances? (Kuo et al., 1998)
Community cohesion	To what extent do you agree with the following statements about your community? Overall, I am very attracted to living or being involved in this area, I feel a sense of belonging when in this community, I have friends I visit in this community, I have made friends in this community that mean a lot to me, Given the opportunity, I would like cease my involvement, When referring to community, I use the term ''we'' rather than ''they'', If I need advice I can ask people in this community, I agree with most people around here about what is important in life, I believe people in this community would help me in an emergency, I feel a sense of loyalty to this community, I borrow things and exchange favors with people here, I would be willing to work with others to improve this community, I plan to remain involved with this community for a long time, I think of myself as similar to the people who live in this community, I regularly interact with people in this community, I rarely have people from this community to my house to visit, A feeling of fellowship runs deep between me and other people here, Living or being involved in this area gives me sense of community (Moore, Townsend, & Oldroyd, 2007)
Local sense of community	People concerned with helping and supporting one another (Kuo et al., 1998)

Table 5.3 Final survey questions relevant to social well-being.

Survey question	Rationale
Do you think there is a link between your well-being and your local natural environment? If so, how are you affected?	This broad question teases out perceived links between well-being and the natural environment. It may tease out examples of social well-being.
Social well-being is related to your relationships, sense of safety, and community bonds. Do you feel that outdoor spaces, like parks and gardens, are important to your social well-being? Why?	This question aims to specifically gather information on the perceived links between outdoor spaces and social well-being. It may give insight on the types of social activities that take place in outdoor spaces.
On a scale from 1-5, where 1 is "Strongly Disagree" and 5 is "Strongly Agree," to what extent do you agree with the following statements about your well-being as it relates to your neighbourhood environment. • *Trees, shrubs, flowers and green space make this a better place*	Indicates sense of place related to greenery presence
On a scale from 1-5… • *I am more sociable in places with trees, shrubs, flowers and green space*	Indicates social interactions
On a scale from 1-5… • *I would be willing to take action to ensure that trees, shrubs, flowers and green space in my neighbourhood are protected*	Indicates social cohesion
On a scale from 1-5… • *Diverse, mature, healthy trees and green space make this a better place*	Indicates sense of place related to greenery quality
On a scale from 1-5… • *I prefer to undertake leisure and/or recreational activities in places with trees, shrubs, flowers and green space*	Indicates place attachment
We want to ask you about outdoor areas you may go to or visit. Do you go to or use the following types of areas? If so, how often? And why do you go there?	An exploration of the uses of different types of green space will help identify the types of natural features that encourage certain forms of social activities
Do you actively take an interest in your neighbourhood environment?	Indicates social cohesion
The following statements represent guiding principles that may or may not matter to you. On a scale from 1-5, where 1 is "Not Important At All" and 5 is "Very	Indicates the importance of community cohesion

*Important," please indicate how **important** each principle is to you.* • *Trusting the people in my community* • *Being proud of living in my community* • *Feeling a sense of belonging in my community*	

Table 5.4 Overview of previous CVC studies with methods used to gather resident input and resulting response rates.

CVC Survey	Method	Approached	Contacted	Completed	Response rate
Lake Ontario Shoreline Survey (CVC, 2012) 22 questions in-person, 20 questions online	In-person (homes) In-person (parks) Online	1388 597 A link to the survey was posted on the CVC website	523 597 n/a	175 305 110	33.5% 51% n/a
Human well-being report (CVC, 2011) 21 questions	Online	Approximately 7,600 (internet panel by Ipsos Reid)	n/a	1,003	13%
BCA Visitor Survey Report (TBD)	In-person (parks)	n/a	n/a	n/a	70.6%

5.2.1 Survey limitations

Six graduate students of various backgrounds conducted the survey. All surveys were completed in pairs with one interviewer and one recorder. Male-female teams were predominantly formed in an attempt to put respondents at ease, though male-male and female-female pairs also occurred depending on the students' availability. Each interviewer had a different style of asking the questions and the variety of speeds, intonations, accents, and use of familiar language may have affected responses. Each recorder also self-selected the amount of speech to write whether it was relevant to the question asked or not. Some recorders noted responses verbatim and others summarized or interpreted what they heard. This bias may have affected the analysis of open-

ended questions where the amount of topics or themes a respondent referred to may be misrepresented.

The surveying period spanned from October 2013 to January 2014. In the changing of the seasons from fall to winter many alterations occurred in the natural environment that could have influenced responses. For instance, thinking of the aesthetic benefits of ecological services may be easier in the fall when trees still have their colorful leaves than it would be in the winter. The time of year at which respondents completed the survey may also have affected their perception or memory of how often they visit various types of green space.

The mixed methods nature of the survey delivery, with 101 filled out in person and 6 on paper by the respondents themselves, also creates differences in the completeness and ranking of responses. Respondents to aural modes are significantly more likely than are respondents to the visual modes to give extreme positive responses (Dillman et al., 2009). However, gathering a sufficiently large sample size was deemed more important than using a single method of delivery.

5.3 Supplementary Data

To get at how the presence and accessibility affect respondent's perception of the ways natural features and areas contribute to their social well-being supplementary biophysical data was used. This analysis is inspired by Fuller et al. (2007) in "Psychological benefits of greenspace increase with biodiversity" where a Likert scale was used to measure respondents' psychological well-being. Linear regressions explored the relationships between biodiversity values (e.g. species richness) and psychological well-being, an analysis that can be adapted here with tree canopy cover values and social well-being.

5.3.1 Distance to watercourses

Distance to watercourses were compiled by MES graduate student Mitch Harrow (2014c). The distance measured is from the centroid of respondents' postal code to the nearest water feature. The scale however, is unknown, and may have overlooked small creeks.

5.4 Data alterations

In recording responses, some errors occurred and assumptions were made to ensure a sufficiently large sample size. Concerning postal code entries were altered following the reasoning presented in Table 5.5. For binomial questions, responses that were indicated as unknowns or "I don't know" were translated as "no."

Table 5.5 Alterations made to postal code entries.

Recorded Postal Code	Concern	Solution	Updated Postal Code
L5W1Z5	Outside of study area	Match to the postal code of the survey completed on the same day	L5W 1A5
L5W1G8	Outside of study area	None – too different	Delete observation
L6W1L7	Outside of study area	Assume typo in writing "W"	L6Y1L7
L6Y1L6	Outside of study area	Assume typo in writing the last "6"	L6Y1L7

5.5 Statistical Analysis

The data obtained from the survey created a variety of categorical, interval, and ordinal variables. Statistical tests for association were run for survey questions relevant to social well-being listed in Table 5.3 against the property and household variables listed in Table 5.5.

In deciding which tests of association to use, general guidelines for choosing a statistical analysis with corresponding R functions were followed. These guidelines are summarized in Table 5.6 and

were retrieved from the Institute for Digital Research and Education at the University of Northern California, Los Angeles (2014).

Table 5.6 Assumptions made about the type of variables.

Variable		Type
Location	Brampton or Mississauga	Categorical
Income	< 40k, 40-59k, 60-79k, 80-99k, 100-119k, 120-159k, 160k +	Interval or Ordinal
Age	18-24, 25-34, 35-44, 45-54, 55-64, 65+	Interval or Ordinal
Ethnicity	S Asian, SE Asian, E Asian, W Asian/Middle Eastern, etc.	Categorical
Years lived in Canada	<1, 1-2, 3-5, 6-10, 11-20, >20	Ordinal
Years lived in neighbourhood	<1, 1-2, 3-5, 6-10, 10+	Ordinal
Home ownership	Own or Rent	Categorical
Household composition	Single, Couple, Single with kids, Couple with kids, Multigenerational, Roommate	Categorical
Education	Grade School, High School, Post-Secondary, Graduate +	Ordinal
Postal code		Categorical
Gender	Female or Male	Categorical
Size of yard	Small, Medium or Large	Ordinal
Presence of trees	Yes or No	Categorical
Presence of flowers/shrubs	Yes or No	Categorical
Number of neighbouring trees	1-2, 3-4, 5-6, 7+	Ordinal

Table 5.7 Property and household variables used for analyses of association

Category	Variables
Location	Brampton (Fletcher's Creek) or Mississauga (Meadowvale)
Social Well-being Perception	Social Well-being Index score Factor Analysis groupings: • PA1 - Social effects: a composite variable of the importance of services provided by natural features and areas • PA2 - Community importance: a composite variable of the importance of trust, pride, and sense of belonging • PA3 – Place attachment: a composite variable of what characterizes a better place
Characteristics of Individual Property	Size of yard Presence of trees Presence of flowers and/or shrubs Number of trees on property and of the two neighbouring properties
Household Characteristics	Age of respondent Ethnic background Years lived in Canada Number of years in neighbourhood Ownership status Household composition Education Postal code Income Gender
Characteristics of Neighbourhood	Distance to nearest water feature *(have Meadowvale only)*

Table 5.8 General guidelines for choosing a statistical analysis. Adapted from UCLA (2014) and MASH (2014).

Nature of independent variable (IV)	Nature of dependent variables (DV)	Tests
1 IV with 2 levels (independent groups)	Interval	2 independent sample t-test
		Wilcoxon-Mann Whitney test
	Ordinal	Wilcoxon-Mann Whitney test
	Categorical	Chi-squared test
		Fisher's exact test
1 IV with 2 or more levels (independent groups)	Interval	One-way ANOVA
		Kruskal Wallis
	Ordinal	Kruskal Wallis
	Categorical	Chi-square test
1 continuous/scale IV	Categorical with 2 levels	Independent t-test
		Wilcoxon-Mann Whitney test
	Categorical with 3+ levels	One-way ANOVA
		Kruskal Wallis
	Continuous or interval	Pearson's correlation coefficient
		Spearman's correlation coefficient
	Any	Simple linear regression

5.5.1 Independent sample t-test / Two Sample Difference of Means Test

The independent sample t-test is used to determine whether the means of who independent samples are significantly different (McGrew & Monroe, 1993). It's applied when data is measured on an interval/ratio scale (McGrew & Monroe, 1993). For example, it was used when comparing respondents that replied yes to perceiving the link between their local natural environment and well-being and respondents that replied no to the same question by looking at the mean age (age assumed to be an interval variable) of these two groups.

5.5.2 Wilcoxon-Mann Whitney test / Wilcoxon Rank Sum W Test

An additional nonparametric test to analyze the differences between samples is the Wilcoxon-Mann Whitney Test (McGrew & Monroe, 1993). An instance where it was applied was to see if there was a

significant difference in the mean size of front yard of respondents that replied yes to the natural environment/well-being question and those that replied no.

5.5.3 Chi-squared test

The chi-square test is another method to determine if a truly significant difference exists between a set of frequencies (McGrew & Monroe, 1993). It compares the observed frequency counts of a single variable (nominal or ordinal) with an expected distribution of frequency counts (McGrew & Monroe, 1993). This test would be used to determine whether there is a significant difference between respondents that rated the statement "Trees, shrubs, flowers and green space make this a better place" depending on the city they live in.

5.5.4 Fisher's exact test

The Fisher's exact test also examines the difference between frequencies, but with one set with an expected frequency of five or less (UCLA, 2014a). The null hypothesis is that the relative proportions of one variable are independent of the second variable (McDonald, 2009). For example, it is used to see if there is a significant difference between respondents that answer "yes" and "no" to the natural environment/well-being question depending on the city they live in.

5.5.5 One-way ANOVA

A one-way analysis of variance is used to assess whether the observed differences among more than 3 sample means are statistically significant (Moore & McCabe, 1993). It is a method for comparing at least 3 population means to test the null hypothesis that the population means are all equal (Moore & McCabe, 1993). This method is used to determine whether there is a significant difference between respondents that rated the statement "Trees, shrubs, flowers and green space make this a better place" depending on their age level.

5.5.6 Kruskall Wallis test

The Kruskall Wallis test is the nonparametric equivalent of ANOVA that examines whether the mean rank values are significantly different (McGrew & Monroe, 1993). It is appropriate when analyzing one independent variable with two or more levels and an ordinal dependent variable (UCLA, 2014a). For instance, it's applied when examining the relationship between the ratings of plants contributing to sense of place (strongly disagree to strongly agree) depending on the number of years lived in Canada (ordinal).

5.5.7 Spearman's Rank Correlation

When data is in ranked form, Spearman's rank correlation coefficient is the most widely used measure of the strength of the association between two variables (McGrew & Monroe, 1993). However, due to the nature of ordinal data, Spearman's rank correlation does not distinguish between a linear relationship and a monotonic one (McGrew & Monroe, 1993).

5.5.8 Simple linear regression

Simple linear regression studies the relationship between a response variable *y* and an explanatory variable *x*, expecting that different values of *x* will produce different mean responses (Moore & McCabe, 1993). For example, it is used to see if the distance from postal code centres to watercourses explains the number of visits in days/year to streams and rivers.

5.5.9 Simple logistic regression

One of the goals of simple logistic regression is to see whether the probability of getting a particular value of the nominal variable is associated with the measurement variable; the other goal is to predict the probability of getting a particular value of the nominal value, given the measurement variable (McDonald, 2009). The null hypothesis is that the probability of a particular value of the nominal variable is not associated with the value of the measurement variable (McDonald, 2009). Simple logistic regression is used when you have one nominal variable with two values (dependent variable) and one measurement variable (independent variable) (McDonald, 2009). It would be

used to see if the number of days/year respondents visit rivers and streams is dependent on the location (Brampton or Mississauga).

5.6 Environmental Social Well-being Index

The creation of an Environmental Social Well-being index is an exercise in analyzing the current state of existing neighbourhoods. The index will be a preliminary mean to analysis with the objective of giving rise to recommendations for future survey and planning. In the creation of the index, indicators and parameters used will follow the SMART and SPICED criteria described in the appendix of the Human Well-Being, Ecosystem Services, and Watershed Management in the Credit River Valley Concept Paper (2013). According to Habitat Conservation Trust Fund – HTCF (2003), watershed indicators shall be:

> Available: the indicator data shall be available and easily accessible. They shall be collected throughout the watershed, published in a routine basis, and made available to the public.
>
> Understandable: indicators shall be easily understood by a diverse range of non-technical audiences.
>
> Credible: indicators shall be supported by valid, reliable information, and interpreted in a scientifically defensible manner.
>
> Relevant: indicators shall reflect changes in management and in activities in the watershed. They shall be able to measure changes over time.
>
> Integrative: indicators shall demonstrate connections among the environmental, social and economical aspects of sustainability.

Example indicators that meet these criteria include social cohesion, place attachment, civic engagement, social interaction, tree canopy cover and access to green space. These dimensions of social well-being are drawn from theory on social well-being (Kuo et al., 1998; Morris & Doick, 2009; Moore, Townsend, & Oldroyd, 2007; Keyes, 1998; Carpiano & Hystad; Forrest & Kearns, 2001; Hernandez et al., 2010; Gosling & Williams, 2010).

To pull these indicators from the survey, two methods of grouping survey questions were used. The first was by grouping the questions by what they were intended to measure in the design of the

survey, based on a literature review as explained in Table 5-2. The second method was through a process of exploratory factor analysis, which groups the survey questions based on the responses.

5.6.1 Pre-determined dimensions of social well-being

When designing the survey questions with the objective of incorporating them into an index, I was strongly inspired by the Integrated Watershed Sustainability Index (WSI), which shares many goals and objectives with this project (Chavez & Alipaz, 2007). The IWSI is based on hydrologic, environmental, life, and water policy issues and responses (Chavez & Alipaz, 2007). It considers watershed management as a dynamic and holistic process and assumes that the sustainability of its water is a function of hydrology (H), environment (E), life (L), and water resources policy (P). In the shape of a pressure-state-response model (PSR), the WSI is given by: WSI = (H + E + L + P) / 4. Both the quantitative and qualitative parameters are divided in five scale scores (0, 0.25, 0.50, 0.75, and 1.0). All indicators have the same weight to allow mutual respect among the different sectors and stakeholders such as hydrologists, sociologists, environmentalists, water users, and policy makers. This follows the *principle of nonsufficient reason* where "In the absence of a sufficient reason to regard any particular indicator as more important than any other, each indicator should be assigned an equal weight" (Michalos et al., 2006).

Following the Chavez & Ailpaz model (2007), survey questions and rated statements were grouped by dimension of social well-being and assigned a five scale score as described in Table 5.7.

Table 5.9 Environmental Social Well-being Index model and formulae

Dimensions of Social Well-Being	Question code	Survey question	Operation	Combined
Sense of place/place attachment (place and space)	V_4_a (likert)	"Trees, shrubs, flowers and green space make this a better place"	As is	**soplace** = (V_4_a + V_4_c + V_4_e + V_4_f)/4
	V_4_c (likert)	"I feel safe in places with trees, shrubs, flowers and green space"	As is	
	V_4_e (likert)	"Diverse, mature, healthy trees and green space make this a better place"	As is	
	V_4_f (likert)	"I prefer to undertake leisure and/or recreational activities in places with trees, shrubs, flowers and green space"	As is	
Social interaction (activities and socializing)	II_1_a,b,c,d,e (open-ended)	"We want to ask you about outdoor areas you may visit… why do you go there?"	socialreasons.recode = score from 1-5 assigned to the responses (see Table 13 for scoring)	**socint** = (socialreasons + swblink + V_4_b)/3
	III_1_b_v (open-ended)	"Do you think there is a link between your well-being and your local natural environment? Why?"	swblink = III_1_b_v*5	
	V_4_b (likert)	"I am more sociable in places with trees, shrubs, flowers and green space"	As is	
Social cohesion (community and neighbourhood)	III_4_a (yes or no)	"Do you actively take and interest in your neighbourhood environment?"	activ = III_4_a * 5	
	V_4_d (likert)	"I would be willing to take action to ensure that trees, shrubs, flowers and green space in my neighbourhood are protected"	As is	**soco** = (activ + V_4_d + VI_1_b + VI_1_d + VI_1_h)/5
	VI_1_b (likert)	"Trusting the people in my community"	As is	
	VI_1_d (likert)	"Being proud of living in my community"	As is	
	VI_1_h (likert)	"Feeling a sense of belonging in my community"	As is	
General	V_3_a (yes or no)	"Do feel that outdoor spaces are important to your social well-being?"	swbimp = V_3_a * 5	**swbimp** = V_3_a * 5
Overall Index: swbindex = (soplace + socint + soco + swbimp)/4				

Table 5.10 Scoring scheme for the social reasons variable of the social interactions dimension. 22 different reasons were listed with a maximum of 7 reasons given per respondent.

Number of social reasons listed	Categorical scale	Score
0 – 1 (1.4)	20% = very low	1
2 – 3 (2.8)	40% = low	2
4 (4.2)	60% = neutral	3
5 – 6 (5.6)	80% = high	4
7 (7)	100% = very high	5

This proposed index of social well-being does have its limitations. It's composed of a variety of question formulations that may not measure the same concept. For instance, the Likert scale questions combine degrees of agreement and importance. This coerces thoughts on *what is* and *what could be* into the same dimension of social well-being, which loses some of its meaning. The multiplication of yes/no responses by five also doesn't truly create a five scale score and may skew the index's overall score.

The main challenge in the creation of the index is defining its scope. Intentionally naming it an *environmental* index of social well-being I was attempting to reduce the number of factors it would require. Many factors influence one's social well-being, from policy to socio-economic factors which are difficult to measure. It is also difficult to choose which of these wide-ranging factors to include, and which to exclude. For these reasons, there was a large emphasis on environmental influences. Unfortunately, the scale of the study areas created difficulties when retrieving environmental conditions. Credit Valley Conservation monitors water and forest conditions from their monitoring stations but do not gather data for the specific study areas.

Future iterations of an environmental social well-being index should prioritize the incorporation of local environmental indicators along with the survey statements to truly capture differences between areas. In keeping with the Chaves & Alipaz model (2007), an institutional analysis and policy should also be considered.

5.6.2 Factor Analysis

Factor analysis has been reported as the method of choice for interpreting self-reporting questionnaires (Williams, Brown, & Onsman, 2012). It can be used to identify groups of statements

measuring a single component of well-being (Fuller et al., 2007) by condensing information so that variation can be accounted for by using a smaller set of variables, or factors (DeVellis, 2012; Williams, Brown, & Onsman, 2012). These determined sets of variables, or factors, are useful in understanding the data and arriving at a meaningful index of social well-being. Exploratory Factor Analysis is a heuristic method to generate a theory, or model from a set of items (Williams, Brown, & Onsman, 2012).

Modeling after Fuller at al. (2007), I used principal axis factoring (PAF) with oblique rotation to identify groups of statements measuring a single interpretable component of social rather than psychological well-being. The conceptual approach of PAF is to try and understand the shared variance in a set of measurements through a small set of variables called factors (Warner, 2012). This differs from the principal component approach of representing all of the variance in the variables through a small set of components (Warner, 2012). The *oblique* rotation method allows the resulting factors to be correlated, unlike the *orthogonal* method (Quick, 2011). Factor structures were based on loadings of an absolute value of 0.40 or greater, and alpha coefficients of at least 0.60 (Fuller et al., 2007).

I followed the steps outlined in an online R tutorial prepared by John Quick (2011), author of *Statistical Analysis with R*, using the survey's 9 Likert scale questions relevant to social well-being:

- 6 statements measuring how much respondents agreed with statements about their well-being as it relates to the environment (Section V, question 4)
- 3 statements measuring the importance of trust, pride, and belonging (Section VI, question 1).

5.6.2.1 Number of Factors

The appropriate number of factors to be used was determined through eigenvalues and generating a scree plot. The scree plot is a graph with factors on the x-axis and eigenvalues on they-axis.

Eigenvalues are produced by principal components analysis and "indicate the amount of variance explained by each principal component or each factor" (Suhr, 2005). Inspecting and interpreting the Scree plot involves taking the point above the debris or break to determine the number of factors to be retained (Williams, Brown, & Onsman, 2012).

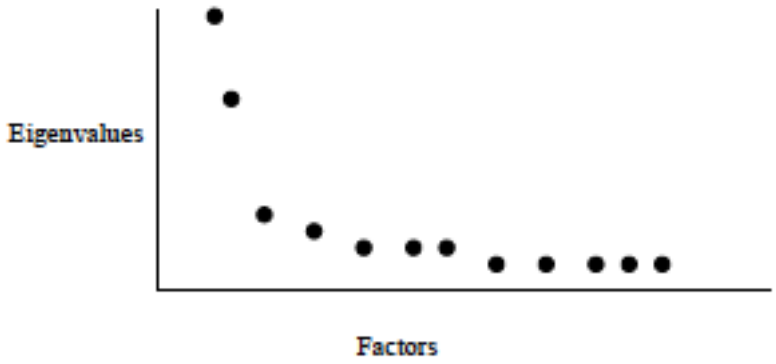


Figure 5.1 Example scree plot. Determining the appropriate number of factors involves interpreting the plot and taking the point above the break, probably 3 in this case. Adapted from Newsom (2005).

To confirm that this number is appropriate, the eigenvalue of these factors is verified. The Kaiser-Guttman rule, or the eigenvalue-one criterion, calls for the retention and interpretation of all factors with eigenvalues greater than 1.0 (O'Rourke et al., 2005). The reasoning is that any component displaying an eigenvalue greater than 1.0 is accounting for a greater amount of variance than had been contributed by one variable, which is sufficiently meaningful to be worthy of retention (O'Rourke et al., 2005).

5.6.2.2 Limitations

Criticisms on exploratory factor analysis are largely based on the subjectiveness of the results, noting that decisions about number of factors and rotational scheme are based on pragmatic rather than theoretical criteria (Williams, Brown, & Onsman, 2012). There is also lack of agreement on the suitable sample size for factor analysis. Some suggest having at least 300 cases, whereas others point out that even 50 cases may be adequate (Williams, Brown, & Onsman, 2012).

Chapter 6: Results

This chapter presents the findings from the 50 samples in Brampton, and 57 in Mississauga. Results presented here are based on representative sample sizes with a confidence level of 90% and a margin of error or 10% (Table 6.1). The survey generated data on the demographics of the study areas, property and neighbourhood characteristics, and the number of visits to different types of outdoor areas respondents make (days/year). It also generated information on how respondents perceive the relationship between the natural environment and their well-being and the factors that affect this perception.

Only relationships significant at P=0.05 or less are shown and bolded. Relationships with coefficient magnitudes less than ±0.7 are considered to be "moderate" and less than ±0.3 to be "weak." Spearman's Rank Correlation Coefficient is differentiated from Pearson's Product Moment Correlation coefficient by a subscript "S" (r_S).

Table 6.1 The collected sample size is representative of the study areas. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

	Fletcher's Creek, Brampton	Meadowvale, Mississauga
Number of households in study area	159	218
Confidence level of sample	90%	90%
Margin of error	10%	10%
Calculated representative sample size	48	52
Actual sample size	50	57

6.1 Demographics

The typical Fletcher's Creek (Brampton) respondent was between 35 and 44 years old (32%), lived with a partner (28.9%), had children (68%), and had been living in the neighbourhood for either less than a year (22.0%) or over ten years (36.0%). About half had completed a post-secondary

education (48%) and the total household income was in the $80,000 – $99,000 range (median). This income range is consistent with the watershed's median of $90,000 (CVC, 2011).

Meadowvale (Missisasuga) respondents tended to be between 45 and 54 years old (45.6%), lived as a couple with kids (84.2%), and had been living in the neighbourhood for over 6 years (77.2%). They had completed either a post-secondary (56.1%) or graduate education (38.6%), and the total household earned between $120,000 and $159,000 (median).

Both areas reported university graduation rates that surpassed that of their respective municipalities. In all of Brampton, only 31.1% of the population aged 25-64 years held a university certificate, diploma or degree in 2011 (Peel Public Health, 2013a) yet 47.6% among 25 to 64 year-olds of Fletcher's Creek survey respondents had a post-secondary degree in 2013-2014. In the City of Mississauga, 44.4% of population aged 25-64 years held a university certificate, diploma or degree in 2011 (Peel Public Health, 2013a) and 51.0% among the same age group of Meadowvale respondents had a post-secondary degree in 2013-2014.

Table 6.2 Comparison of income and university graduation rates across scales. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

Source and scale	*Canadian Index of Wellbeing* (2014): Ontario	*CVC Human Well-being Report* (2011): Credit River Watershed	*Watershed Well-being* Survey Results (2013-2014): Fletcher's Creek, Brampton	*Watershed Well-being* Survey results (2013-2014): Meadowvale, Mississauga
Income	Median family income of $66,000 in 2010.	Median household income of just over $90,000 based on the 2006 census estimates.	Median household income of $80,000-$99,000 in 2013-2014.	Median household income is between $120,000 and $159,000 in 2013-2014.
University graduate rates	University graduation rates among 25 to 64 year-olds in Ontario were 29.7% in 2010.	University undergraduate degree (Bachelor's) is 24.4% based on the 2006 census estimates.	47.6% among 25 to 64 year-olds of Brampton respondents had a post-secondary degree in 2013-2014.	51.0% among 25 to 64 year-olds of Mississauga respondents had a post-secondary degree in 2013-2014.

Respondents of both study areas identified with the regions of origin in Southern Europe (21.7%), Northern Europe (17.0%), and South Asia (16.8%), similar to the distribution of ethnic origin reported on the 2006 census estimates for the Credit River Watershed (CVC, 2011). Most had been living in Canada for over 20 years (31.8%) or were born and raised in the country (47.7%). The majority of respondents from both areas owned their place of residence (90.7%) though the likelihood of renting is higher in Brampton (Fisher's exact test p=0.04). 56.6% of respondents were male and 43.4% were female, with no significant difference between study areas.

Table 6.3 Comparison of ethnic origin from the Credit River Watershed population and the survey sample of the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014. *Watershed population numbers are based on the 2006 census estimates for the Credit River Watershed (CVC, 2011).

	South Asian	East & Southeast Asian	West Asian or Middle Eastern	European	African	Central or South American	Caribbean	Canadian	Other
Watershed population*	14.9%	10.2%	3.2%	51.2%	2.0%	1.5%	4.9%	10.3%	2.5%
Total Survey Sample	16.8%	4.7%	4.7%	48.1%	1.9%	2.8%	5.7%	7.5%	7.8%
Fletcher's Creek (Brampton)	14%	4%	4%	44%	4%	2%	8%	14%	6%
Meadowvale (Mississauga)	19.3%	5.3%	5.3%	50.9%	0%	3.5%	3.5%	1.8%	10.4%

6.2 Neighbourhood characteristics

6.2.1 Size of front yard

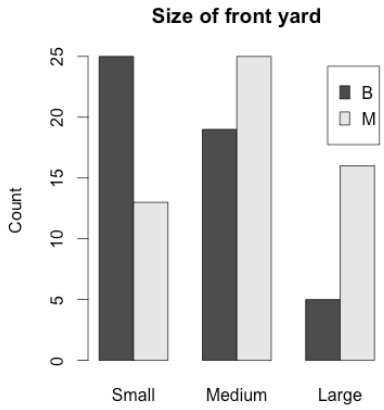


Figure 6.1 Count of subjective front yard sizes observed by surveyors. There is a significant difference between Brampton and Mississauga properties with a *p*-value of 0.006 for both Chi-squared test and Fisher's exact test. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

Surveyors recorded observations on the presence of natural features in respondent's front yards. 51.0% of front yards in Fletcher's Creek were described as being "small" (less than 25m^2) while 46% were described as being of "medium" size (between 25m^2 and 50m^2) in Meadowvale. There is a significant difference between property sizes of study areas with a Wilcoxon Mann-Whitney p-value of 0.002, W=877.

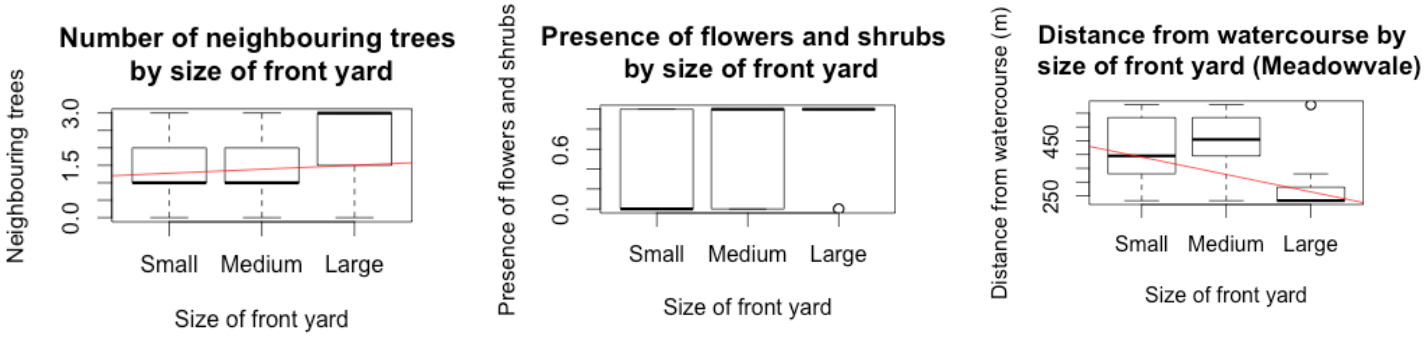


Figure 6.2 Associations between size of front yard and number of neighbouring trees (p=0.002, r_S=0.307), presence of flowers and shrubs (p=1.5871×10^{-4}, W=721), and distance from watercourse (p=0.020, r_S=-0.232). Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

Overall, there is a significant moderate correlation between size of front lawns and the number of trees present on adjacent properties (p=0.002, r_S=0.307). The larger the front yard, the more tree canopy cover will be present on the respondent's and its neighbour's properties. This relationship is significant for the Meadowvale sample as well (p=0.002, r_S=0.423) though not for Fletcher's Creek (p=0.810, r_S=-0.035).

For all samples, a significant weak correlation was found between size of front yards and distance from centroid of residence's postal code to the nearest watercourse (p=0.020, r_S=0.232). A significant negative moderate correlation was found for the Meadowvale sample (p=0.007, r_S=-0.367), but none for Fletcher's Creek (p=0.254, r_S=0.168).

The size of front yard is also associated with the presence of flowers and shrubs (Wilcoxon Mann-Whitney test p=1.5871×10^{-4}, W=721). Small front yards tended not to have any flowers and shrubs while medium and large sized ones had at least one flower or shrub.

Table 6.4 Statistical tests exploring relationships between size of front yard with other neighbourhood characteristics. Each combination of variables was tested and the result, where significant, is shown and bolded. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

	Dependent variable: Size of front lawn (small, medium, or large)								
	All			Brampton			Mississauga		
Independent variables	Spearman Correlation	Kruskal Wallis	Simple linear regression	Spearman Correlation	Kruskal Wallis	Simple linear regression	Spearman Correlation	Kruskal Wallis	Simple linear regression
Neighbouring trees	**p=0.002 r=0.307**	**p=2.221×10^{-4} $\chi^2(3)$=19.437**	**p=3.16×10^{-4} $F(100)$=13.93 R^2=0.122**	p=0.810 r=-0.035	p=0.466 $\chi^2(3)$=2.555	p=0.773 $F(47)$=0.084 R^2=0.002	**p=0.002 r=0.423**	**p=0.003 $\chi^2(3)$=13.648**	**p=0.003 $F(51)$=9.94 R^2=0.163**
Distance from watercourse	**p=0.020 r=-0.232**	**p=8.098×10^{-4} $\chi^2(17)$=41.431**	p=0.223 $F(98)$=1.505 R^2=0.015	p=0.254 r=0.168	p=0.035 $\chi^2(9)$=18.005	p=0.174 $F(46)$=1.905 R^2=0.034	**p=0.007 r=-0.367**	**p=0.008 $\chi^2(7)$=18.935**	**p=0.007 $F(50)$=7.992 R^2=0.138**
Independent variables	Wilcoxon Mann-Whitney	Chi-squared		Wilcoxon Mann-Whitney	Chi-squared		Wilcoxon Mann-Whitney	Chi-squared	
Presence of flowers	**p=1.5871×10^{-4} W=721**	**p=7.31×10^{-4} $\chi^2(2)$=14.442**		**p=0.046 W=210**	p=0.122 $\chi^2(2)$=4.215		**p=0.014 W=153.5**	**p=0.044 $\chi^2(2)$=6.248**	

6.2.2 Flowers and shrubs

The presence of flowers and/or shrubs on respondents' front yards was also recorded, finding that 61.3% of respondents planted shrubs or flowers in front of their homes. There is a significant difference between study areas (Chi-squared test p=0.026, χ^2=4.924; Fisher's exact test p=0.018) with 71.9% of Meadowvale respondents having flowers or shrubs on their front yards compared to 61.3% for Fletcher's Creek. Depending on the study area, size of yard, presence of trees, number of surrounding trees, years lived in Canada, years lived in neighbourhood, and education all affected the presence of flowers and shrubs.

Table 6.5 Statistical tests exploring relationships between presence of flowers and shrubs with demographics and other neighbourhood characteristics. Each combination of variables was tested and the result, where significant, is shown and bolded. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

	Dependent variable: Presence of flowers and/or shrubs on front yards (yes, no)					
	All		Brampton		Mississauga	
Independent variables	Wilcox-Mann Whitney		Wilcox-Mann Whitney		Wilcox-Mann Whitney	
Years lived in Canada	p=0.288 W=1180.5		**p=0.043** **W=207**		p=0.491 W=364.5	
Years lived in neighbourhood	**p=0.008** **W=937**		**p=0.014** **W=181**		p=0.425 W=285.5	
Education	p=0.148 W=1130		p=0.470 W=0.469		**p=0.032** **W=222**	
Size of yard	**p=1.587×10^{-4}** **W=721**		**p=0.046** **W=210**		**p=0.014** **W=153.5**	
Neighbouring trees	**p=0.012** **W=868**		p=0.084 W=219		p=0.760 W=254.5	
Independent variables	Chi-squared	Fisher's exact	Chi-squared	Fisher's exact	Chi-squared	Fisher's exact
Presence of trees	**p=0.003** **$\chi^2(1)$=8.777**	**p=0.002**	p=0.078 $\chi^2(1)$=3.116	p=0.062	p=0.111 $\chi^2(1)$=2.546	p=0.100

6.2.3 Trees

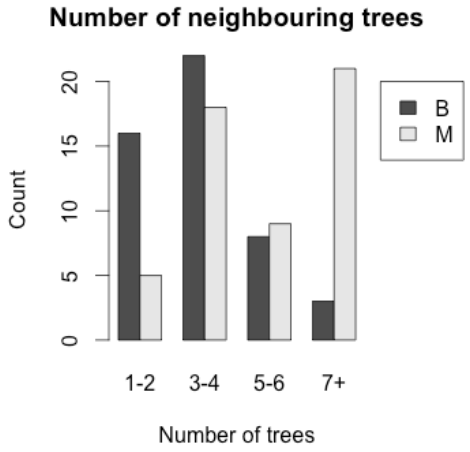


Figure 6.3 Count of number of trees on respondent's front yard and that of their two immediate neighbours. There is a significant difference between study areas with a Wilcoxon rank sum test p-value of 2.417 × 10^{-5}, W=695.5. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

The presence of trees on respondents' front yards was also observed, determining that 77.4% of respondents had at least one tree in the front of their homes. No significant difference was found between the two study areas. However, there is a significant difference between study areas for the *count of number of trees* present on respondents' front yard and that of their two immediate neighbours (Wilcoxon Mann-Whitney p-value of 2.417×10^{-5}, W=695.5). This count is an indicator of the amount of tree canopy cover of each neighbourhood and shows that it is more concentrated in Meadowvale than in Fletcher's Creek.

Overall, the number of neighbouring trees is weakly related to the distance from the centre of a postal code area to the nearest water feature (p=0.012, r_S=0.250). However, his relationship is not manifested in Fletcher's Creek (p=0.285, r_S=-0.158) and there is a moderate negative correlation for Meadowvale (p=0.023, r_S=-0.316).

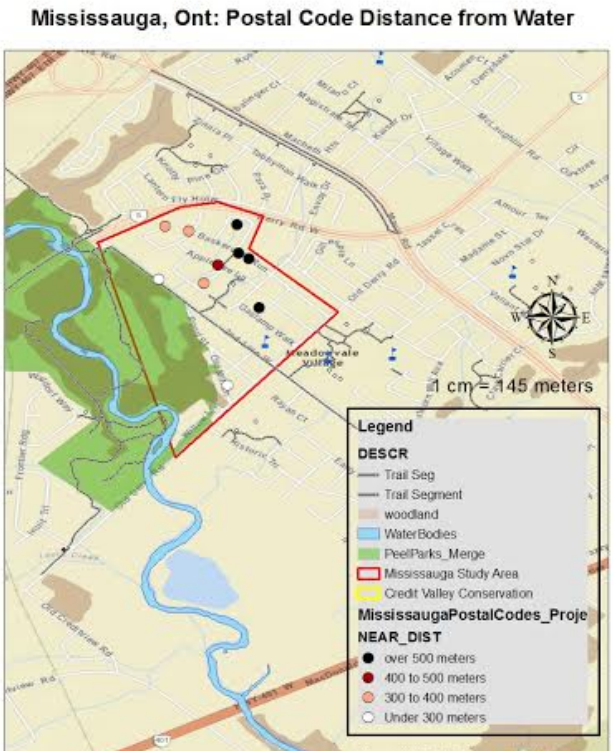


Figure 6-4 Distance from centre of postal codes to nearest water feature in Meadowvale, survey sample Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014. Prepared by Mitch Harrow (2014f).

6.2.4 Distance to nearest watercourse

The distance to nearest watercourse is related to location, home ownership, household composition, income, size of yard, and neighbouring trees. The study areas differ significantly in terms of distance from respondent's residence centre of postal codes to the nearest watercourse (Wilcoxon Mann-Whitney test p-value of p=<2.2×10^{-16}, W=30). The mean distance for Fletcher's Creek postal codes is 139.14m while it is 394.8m for Meadowvale postal codes.

There is a significant difference between distance to the nearest watercourse and size of yard (Kruskal Wallis p=0.048, $\chi^2(2)$=6.067) with a significant weak positive correlation overall (p=0.020 r_S=0.232), no relationship in Brampton, and a significant moderate negative relationship in Meadowvale (p=0.007, r_S=-0.367). In Meadowvale, distance from watercourses decreases with size of yard.

The number of neighbouring trees follows a similar trend to that of size of yard. Overall, there is a significant weak positive correlation (p=0.012, r_S=0.250) while in Meadowvale, there is a significant moderate negative correlation (p=0.023, r_S=-0.316).

A home is more likely to be near a watercourse if it is owned rather than rented (t-test p=0.007, $t(15)$=3.158). Overall, though not within the individual study areas, there is a moderate positive correlation between distance to the nearest watercourse and income (r_S=0.459, p=1.454×10^{-5}), suggesting that the higher earners live furthest away from watercourses.

Table 6.6 Statistical tests exploring relationships between distance from respondent's residence centre of postal code to nearest water features with demographics and other neighbourhood characteristics. Each combination of variables was tested and the result, where significant, is shown and bolded. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

	Dependent variable: Distance from centre of postal code to nearest watercourse					
	All		Brampton		Mississauga	
Independent variables	Independent t-test	Wilcoxon-Mann Whitney test	Independent t-test	Wilcoxon-Mann Whitney test	Independent t-test	Wilcoxon-Mann Whitney test
Location	***p*=<2.2×10^{-6} *t*(620.84)=-14.394**	***p*=<2.2×10^{-6} *W*=30**	n/a	n/a	n/a	n/a
Home ownership	***p*=0.007 *t*(14.905)=3.158**	*p*=0.160 *W*=549	***p*=0.036 *t*(17.42)=-2.269**	***p*=0.036 *W*=88**	Not enough 'y' observations	*p*=0.924 *W*=29
Independent variables	Kruskal Wallis	Spearman correlation	Kruskal Wallis	Spearman correlation	Kruskal Wallis	Spearman correlation
Income	***p*=0.003 χ^2(6)=20.094**	***p*=1.454×10^{-5} *r*=0.459**	***p*=0.014 χ^2(6)=16.015**	*p*=0.332 *r*=-0.158	*p*=0.520 χ^2(5)=4.209	*p*=0.583 *r*=0.087
Size of yard	***p*=0.048 χ^2(2)=6.067**	***p*=0.020 *r*=0.232**	*p*=0.193 χ^2(2)=3.288	*p*=0.254 *r*=0.168	***p*=0.002 χ^2(2)=12.666**	***p*=0.007 *r*=-0.367**
Neighbouring trees	*p*=0.072 χ^2(3)=6.986	***p*=0.012 *r*=0.250**	*p*=0.203 χ^2(3)=4.601	*p*=0.285 *r*=-0.158	*p*=0.054 χ^2(3)=7.638	***p*=0.023 *r*=-0.316**

6.3 Visits to outdoor areas

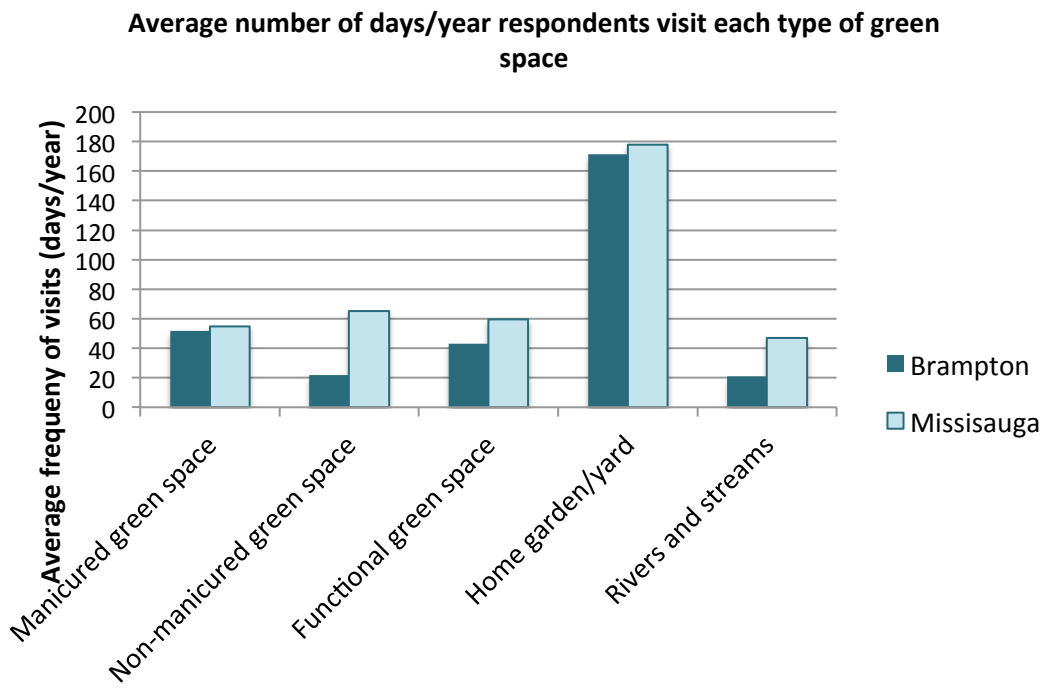


Figure 6.5 Average number of visits in days per year for each type of outdoor space by study area. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

Table 6.7 Percent of respondents who indicated that they had visited various types of outdoor areas. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

	Manicured Green Space	Home Garden/yard	Blue space	Functional Green Space	Non-manicured Green Space
Brampton	86%	84%	62%	64%	45%
Mississauga	89%	81%	88%	72%	80%
All	88%	82%	76%	68%	64%

The majority of respondents answered "yes" to visiting manicured green space (88%) and home gardens and yards (82%). However, when it came to stating how often they visited these spaces home gardens and yards are by far the most frequented with an average of 174.7 days/year for home yards followed by an average of 53.4 days/year for manicured green space. Mississauga respondents tend to visit non-manicured spaces more than twice as often as Brampton respondents

(with a significant difference t-test p=0.019, t(77.3)=-2.398; Wilcoxon-Mann Whitney p=0.001, W=776). The higher amount of parkland and woodland present in the Meadowvale area is likely the reason Meadowvale respondents visit non-manicured spaces more often (see Table 4.5).

In Mississauga, the number of visits to non-manicured green space is moderately negatively correlated with the distance from the centre of postal codes to the nearest watercourse (p=0.008, r=-0.372). Visits to non-manicured green space such as wetlands and forests decrease with distance to watercourses. The shorter the distance of a respondent's postal code to a watercourse, the respondent will report visiting non-manicured green space more often.

The number of visits to streams and rivers is also weakly positively correlated to the distance to watercourse (p=0.023, r=0.233) for all samples though the relationship is not significant within the individual study areas. Visits to streams and rivers increase with distance to watercourses. Respondents with postal code centroids furthest away from a watercourse will visit streams and rivers more often.

Table 6.8 Statistical tests exploring relationships between the number of visits to non-manicured green space (days/year) with demographics and neighbourhood characteristics. Each combination of variables was tested and the result, where significant, is shown and bolded. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

	Dependent variable: Number of days/year respondents visit non-manicured green space					
	All		Brampton		Mississauga	
Independent variables	Kruskal Wallis	Spearman correlation	Kruskal Wallis	Spearman correlation	Kruskal Wallis	Spearman correlation
Education	***p*=0.036** **$\chi^2(3)=8.572$**	***p*=0.029** **$r_S=0.219$**	$p=0.080$ $\chi^2(3)=6.749$	$p=0.084$ $r_S=0.250$	$p=0.870$ $\chi^2(2)=0.279$	$p=0.638$ $r_S=0.067$
Income	$p=0.214$ $\chi^2(6)=8.347$	***p*=0.022** **$r_S=0.258$**	$p=0.352$ $\chi^2(6)=6.679$	$p=0.132$ $r_S=0.243$	$p=0.504$ $\chi^2(5)=4.330$	$p=0.553$ $r_S=-0.098$
	Pearson correlation	Simple linear regression	Pearson correlation	Simple linear regression	Pearson correlation	Simple linear regression
Distance from watercourse	$p=0.996$ $r=0.001$	$p=0.996$ $R^2=3.144\times10^{-7}$ $F=2.987\times10^{-5}$	$p=0.865$ $r=-0.025$	$p=0.865$ $R^2=0.001$ $F=0.029$	***p*=0.008** **$r=-0.372$**	***p*=0.008** **$R^2=0.139$** **$F=7.562$**

6.3.1 Activities for each outdoor area

Manicured green spaces are mostly visited as places to bring kids (*n*=25), go for walks and hikes (*n*=30) and for sports and recreation (*n*=14). Non-manicured green spaces are mainly used for walking and hiking (*n*=26), for biking (*n*=10), to bring kids (*n*=9) and for recreation (*n*=9). Functional green spaces are frequented when accompanying kids to school (*n*=23), playing golf (*n*=22) and going to cemeteries (*n*=11). Home gardens and yards are used for gardening and maintenance (*n*=56), to sit and relax (*n*=17), to have a meal outdoors (*n*=9) and simply for enjoyment (*n*=9). Streams and rivers are visited for hikes and walks (*n*=19), fishing (*n*=9), and to enjoy the scenery and aesthetics of the place (*n*=6).

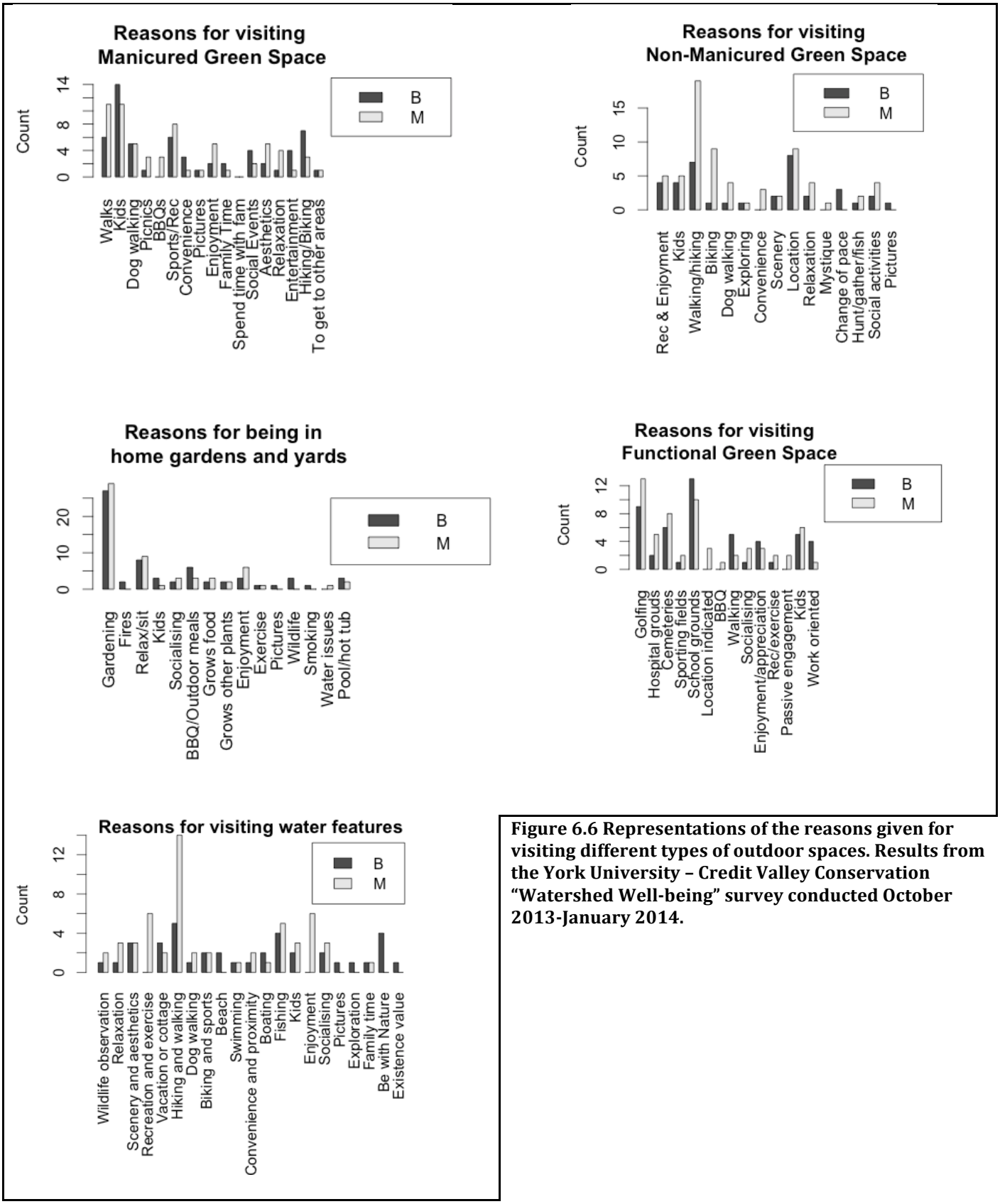


Figure 6.6 Representations of the reasons given for visiting different types of outdoor spaces. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

6.4 Well-being and environment link

6.4.1 III 1: Do you think there is a link between your well-being and your local natural environment?

Table 6.9 Percent of respondents who indicated that there is a link between their well-being and local natural environment. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

	n	Yes	No
All	107	96.3%	3.7%
Brampton	50	92%	8%
Mississauga	57	100%	0%

A Fisher's exact test determined a significant difference between location and agreeing that there is a link between well-being and the local natural environment of respondents (p=0.045), though the Chi-squared test did not yield a significant p-value (p=0.096, χ^2=2.775). The perceived relationship is determined to be related to the distance to nearest watercourse by a two sample t-test (p=1.909×10^{-8}, t(31.4)=-7.464) though unconfirmed by the Wilcoxon-Mann Whitney test (p=0.064, W=90.5). The distance from the centroid of respondents' postal codes to the nearest watercourse for respondents that indicated "yes" to "do you think there is a link between your well-being and your local natural environment" was on average 279.8m in comparison to an average distance of 138.6m for respondents that indicated "no."

A high number of visits to all types of outdoor spaces does not affect the link perception between well-being and the natural environment. When examining the responses against Likert scale ratings of the importance of different types of green space, there are significant relationships. Respondents that indicated that there is a link are likely to also rate streams and rivers as important contributors to well-being (W=86, p=0.028), wetlands and forests as important to well-being (W=40, p=0.003) and open green space as important to well-being (W=95, p=0.049).

Table 6.10 Statistical tests exploring relationships between respondents indicating that the local natural environment is linked to well-being with neighbourhood characteristics and ranked importance of outdoor spaces to well-being. Each combination of variables was tested and the result, where significant, is shown and bolded. Since 100% of Meadowvale respondents replied "yes," an insufficient number of rows and columns was available to perform tests for that sample. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

	Dependent variable: Perceived link between well-being and the local natural environment					
	All			Brampton		
Independent variables	Chi-squared	Wilcoxon-Mann Whitney	2 sample t-test	Chi-squared	Wilcoxon-Mann Whitney	2 sample t-test
Distance from watercourse		p=0.064 W=90.5	**p=1.909×10^{-8}** **t(31.4)=-7.464**		p=1 W=90.5	p=0.964 t(4.7)=-0.048
Importance of streams and rivers	**p=4.446×10^{-5}** **χ^2(5)=27.555**	**p=0.028** **W=86**	p=0.136 t(3.1)=-2.007	**p=0.033** **χ^2(5)=12.151**	p=0.085 W=45.4	p=0.194 t(3.3)=-1.630
Importance of wetlands and forests	**p=0.005** **χ^2(5)=16.932**	**p=0.003** **W=40**	**p=0.014** **t(3.4)=-4.619**	p=0.092 χ^2(5)=9.466	**p=0.021** **W=29**	**p=0.021** **t(4.4)=-3.532**
Importance of open green space	**p=0.001** **χ^2(5)=20.840**	**p=0.049** **W=95**	p=0.185	p=0.055 χ^2(4)=9.239	p=0.065 W=43.5	p=0.189

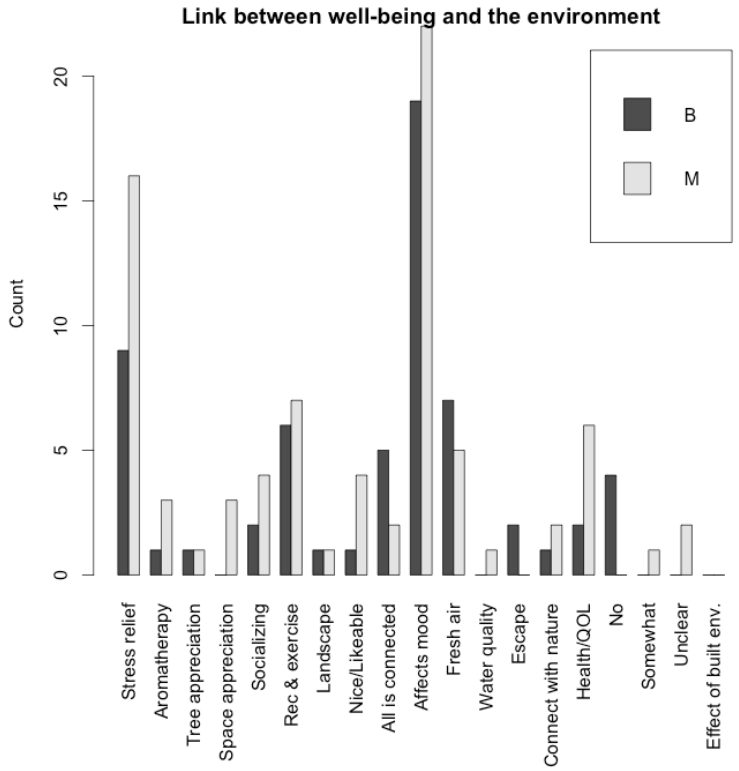


Figure 6.7 Grouped responses to the question: "Do you think that there is a link between your well-being and your local natural environment? If so, how are you affected?" Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

Table 6.11 Top ways that the local natural environment affects well-being. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

Brampton	Mississauga
Affects mood, stress relief, fresh air, "all is connected"	Affects mood, stress relief, recreation and exercise

When asked to elaborate on their answers, respondents from both study areas explained that the local natural environment mostly affects their well-being by affecting their mood (*n*=41), an example being that "you get happier when you see natural features." Reducing stress levels (*n*=24) is the second-most reported effect of the local natural environment, where respondents feel "stress free when seeing trees," claim that "green space is relaxing" and when walking into natural areas "anxiety melts away." Six respondents gave examples of social well-being using the words "community" and even "social interaction" (see Table 6.12).

Table 6.12 Narrative for the socializing-related responses to how the local natural environment of respondents affects their well-being. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

- "Here you feel like you're part of a community instead of a place to live."
- "People know each other here, I know the name of everyone in this village and know their aches."
- "Good exercise; good for the soul; social place."
- "Clean environment allows for social interaction."
- "Allows for more family time and the ability to communicate."
- "If you have good community, it attracts."

6.4.2 V 3: Do you feel that outdoor spaces, like parks and gardens, are important to your social well-being?

The large majority of respondents (93.5%) answered "yes" to the question:

> "Social well-being is related to your relationships, sense of safety, and community bonds. Do you feel that outdoor spaces, like parks and gardens, are important to your social well-being? Why?"

There is no significant difference between the study areas in the responses for this question.

Table 6.13 Percent of respondents indicating that there is a link between their social well-being and outdoor environment. There is no significant difference between the study areas. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

	n	Yes	No	Don't Know
All	107	93.5%	5.6%	0.9%
Brampton	50	94%	6%	0%
Mississauga	57	93.0%	5.3%	1.7%

The number of neighbouring trees may also be related to these responses in Fletcher's Creek (χ^2=21.090, p=1.008×10^{-4}) as could distance from watercourse in the Mississauga sample (W=18, p=0.026).

The number of visits to a variety of outdoor spaces may also be related responses, though it is not clearly demonstrated across all statistical tests. For the Mississauga sample, indicating that outdoor spaces are important to SWB is related to the number of visits to home gardens and yards with a significant difference between "yes" and "no" group (t(49)=8.914, p=7.921×10^{-12}).

Table 6.14 Statistical tests exploring relationships between indicating that outdoor spaces are important to social well-being with neighbourhood characteristics and frequency of visits to outdoor spaces. Each combination of variables was tested and the result, where significant, is shown and bolded. "Don't know" responses are excluded, n=101. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

	Dependent variable: Perceived link between social well-being and outdoor spaces					
	All		Brampton		Mississauga	
Independent variables	Chi-squared test		Chi-squared test		Chi-squared test	
Neighbouring trees	p=0.241 $\chi^2(3)$=4.2		**p=1.008×10^{-4}** **$\chi^2(3)$=21.090**		p=0.484 $\chi^2(3)$=2.453	
	Wilcoxon-Mann Whitney test	Independent t-test	Wilcoxon-Mann Whitney test	Independent t-test	Wilcoxon-Mann Whitney test	Independent t-test
Distance to watercourse	p=0.127 W=182.5	**p=0.010** **t(8.8)=-3.263**	p=0.124 W=32.5	p=0.206 t(2.4)=-1.730	**p=0.026** **W=18**	**p=3.73×10^{-13}** **t(50)=-9.751**
Visits to manicured green space	p=0.273 W=200	p=0.840 t(5.2)=0.212	p=0.333 W=41.5	**p=0.001** **t(42.3)=-3.469**	p=0.407 W=52	p=0.615 t(2)=0.588
Visits to functional green space	p=0.738 W=209.5	p=0.245 t(6.5)=-1.277	p=0.737 W=74	p=0.900 t(2.7)=-0.138	p=0.351 W=29	**p=0.007** **t(47.9)=-3.634**
Visits to home gardens	p=0.310 W=361.5	p=0.331 t(5.5)=1.066	p=0.644 W=59	p=0.793 t(2.2)=-0.297	p=0.051 W=124.5	**p=7.921×10^{-12}** **t(49)=8.914**

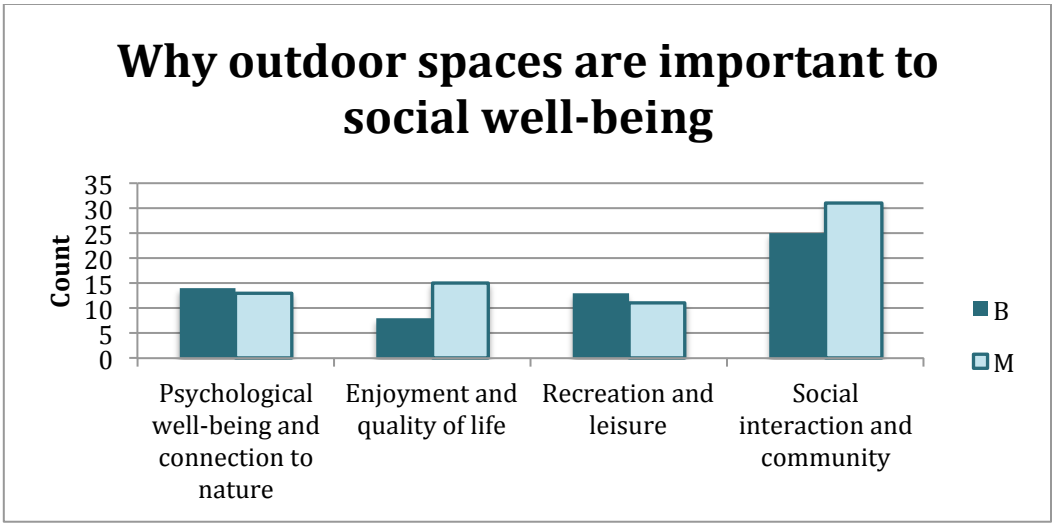


Figure 6.8 Grouped open-ended answers to the question: "Do you feel that outdoor spaces, like parks and gardens, are important to your social well-being? Why?" Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

When asked about the importance of outdoor spaces for social well-being, most respondents explained that they created good gathering and meeting spaces and they are places in which to talk and interact. Together, these responses were grouped into the "Social interaction and community" category (*n*=57). Outdoor spaces were also described as important for stress relief and relaxation (*n*=27), and places where one can "feel good" (*n*=23). These were grouped into "Psychological well-being and connection to nature" and "Enjoyment and quality of life," respectively. Respondents also offered example of food-centric social activities that occur outdoors as well as visits to parks as outings or destinations, which were included under "Recreation and leisure" (*n*=24). Tables 6.15 through 6.18 present sample responses from each category, refer to Appendix 3 for all responses.

6.4.2.1 Social interaction and community

Outdoor spaces like parks and gardens are important to respondents firstly because they create gathering and meeting places (*n*=29), for example, they are a "great way to meet people in the neighbourhood." Secondly, they offer places to talk and interact (*n*=17) because they "promote

social interaction, you unplug, communicate, look in peoples faces." Thirdly, they serve as destinations for outings (*n*=7) and "it contributes to a sense of community" (*n*=4).

Table 6.15 Example responses from the "Social interaction and community" category and its sub-categories. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

Gathering and meeting places	• "Neighbours get together and meet outside" • "Gather together, street parties, meeting people going through parks and trails" • "Great way to meet people in the neighbourhood" • "Helps bring the neighbourhood together, meet neighbours, create relationships that last weeks, years"
Places to talk and interact	• "We'll have a fire with neighbours, sit outside and talk" • "Get together to socialize and increase relations" • "You get to interact with people. In everyday life you don't get to say hi but you can in a park." • "100%. It promotes social interaction, you unplug, communicate, look in peoples faces"
Destination and outings	• "Going out on dates or family outings" • "Families need to get out more together" • to go for walks with someone; go for a coffee or drink and go for a walk [at] Port Credit" • "They're good places to go with people"
Community	• "Neighbours get together and meet outside, it contributes to a sense of community"

6.4.2.2 Recreation and leisure

Outdoor spaces were mentioned as places where respondents practice sports, and where kids can "have fun" (*n*=18). They are also where people go for picnics, barbecue, and go for a walk after a drink or coffee (*n*=6).

Table 6.16 Example responses from the "Recreation and leisure" category and its subcategories. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

Physical activity and play	• "Going out on dates or family outings; parks are nice for walks and bike rides" • "Relaxing time, kids have fun in the park, they can do what they want (run around)" • "Most of the sports we do are in the parks, a place to gather, walk dogs with friends, soccer, volleyball, baseball" • They promote an area for people to gather in and exercise"

Food activity	• "It depends on good weather. We can go for BBQ, etc." • "Picnics with family. Inside you watch TV, outside is time with the family" • "More parks all people meet and picnic, effect is social" • "'5.' Nice to go for walks with someone, go for a coffee or drink and go for a walk (Port Credit)"

6.4.2.3 Psychological well-being and connection to nature

Evidence of the outdoors contributing to social well-being by affecting psychological well-being was offered through examples of stress-relief, connection to nature, and escape. For stress relief and relaxation (*n*=16) one respondent explained that parks allow a state of mind that encourages more relaxed interactions with people. In the connection to nature (n=5) and escape category (*n*=4) respondents reported enjoying being able to connect with nature and that it was important to be able to get away from highly urbanized areas. Lastly, respondents also stated that relaxation is better achieved in the fresh air offered by natural areas (*n*=3).

Table 6.17 Example responses from the "Psychological well-being and connection to nature" category and its subcategories. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

Stress relief and relaxation	• "Stress relieving" • "State of mind – interaction with people makes more relaxed" • "Because it allows you to be in a more relaxed environment and therefore allows you to be in a better mood so you can cope with everyday stress better and feel safer." • "Somewhere to go away from concrete jungle; calming effect"
Connection to nature; nature appreciation	• "Like being with nature" • "Important to give us some kind of connection to nature." • "I like to be able to interact with the environment around me."
Escape	• "Important when you live in a large city to have somewhere to escape from noise and pollution." • "Somewhere to go away from concrete jungle."
Fresh air	• Fresh air = health • "Relaxation, air is more pure." • "Good to get out get fresh air, away from video games."

6.4.2.4 Enjoyment and quality of life

Many respondents stated that spaces like parks and gardens made them feel happy and good (*n*=12). Words such as "like", "love", and "nice" were also used to express how pleasant these spaces are (*n*=6). One respondent referred to quality of life being improved by green space: "if we have green space in proper places it enhances life and quality of life." Others spoke of safety and comfort (*n*=4), of how a neighbourhood with a lot of greenery is associated to trust and safety.

Table 6.18 Example responses from the "Enjoyment and quality of life" category and its subcategories. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

Enjoyment; happiness, fun, feel good	• "They just make me feel alive and happy." • "Beauty of garden makes you feel good" • "Go outside and have fun, can't do it on a regular street" • "If you live in a space that has proximity to green space you feel better"
Pleasant (I like it)	• "Not really in a park, we made our slice of heaven in the backyard." • "I like to be able to interact with the environment around me." • "I love sitting outside." • "It's nice to have [parks] close to you."
Quality of life	• "Definitely. Tied to everyday life. If we have green space in proper places it enhances life and quality of life. I'm disappointed when places lack them."
Safety and comfort	• "I can leave my door unlocked." • "If you feel more comfortable in your neighbourhood you go out more." • "Gathering places and safety"

6.4.3 Do you take an interest in your neighbourhood environment?

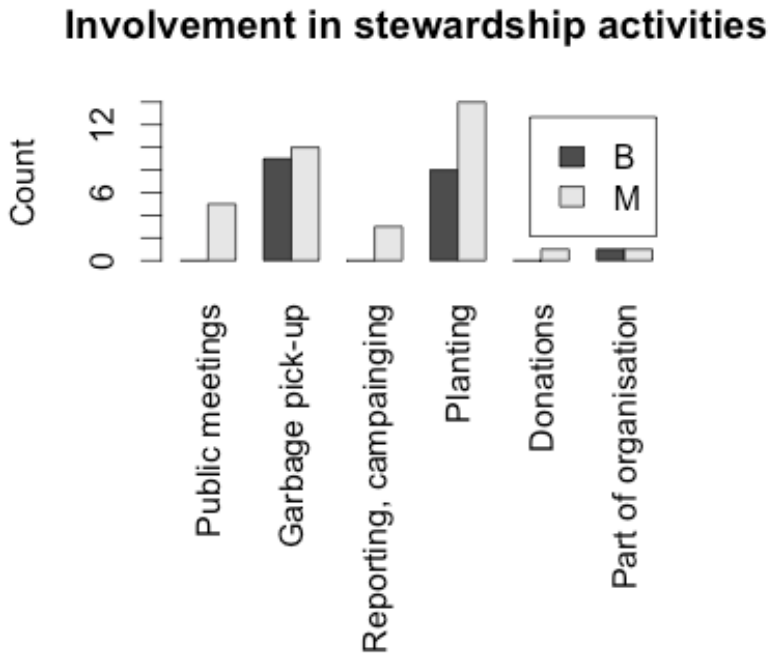


Figure 6.9 Ways in which respondents are involved in their neighbourhood environment. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

38.3% of respondents indicated taking an interest in their neighbourhood environment by planting trees or gardening (n=22), picking up garbage (n=19), attending public meetings (n=3), and other (n=6). Participation in stewardship activities was found to be related to the number of years lived in Canada ($\chi^2(6)=12.736$, $p=0.047$) and in Meadowvale, also for the number of years lived in that neighbourhood ($\chi^2(4)=9.7$, $p=0.046$). Size of yard also is related to responses, indicating "yes" to volunteering and taking an interest in neighbourhood environment is associated with having a large front yard (Chi-squared $\chi^2(2)=8.829$, $p=0.012$).

Respondents that indicated "yes" also rated streams and rivers as important contributors to well-being (Chi-squared $\chi^2(5)=11.678$, $p=0.039$), suggesting that respondents that engage in stewardship activities highly value streams and rivers. Respondents that indicated "yes" also visit

streams and rivers slightly more often than those that indicated "no" (W=746, p=0.013). In Meadowvale, respondents that engage in stewardship activities also live within closer distance to a watercourse (W=522.5, p=0.006).

Respondents that take an interest in their neighbourhood environment visit non-manicured spaces more often (W=771.5, p=0.003). Involved respondents also spend more time in their home gardens and yards than those that do not partake in stewardship activities (W=943.5, p=0.021).

Table 6.19 Tests exploring the relationship between respondents taking an interest in their neighbourhood environment and other variables. "Don't know" answers recoded to "no." Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

	Dependent variable: Taking an interest in neighbourhood environment					
	All		Brampton		Mississauga	
	Chi-squared test		Chi-squared test		Chi-squared test	
Years lived in Canada	***p*=0.047** **χ^2(6)=12.736**		*p*=0.287 χ^2(6)=7.376		***p*=0.047** **χ^2(3)=7.935**	
Years lived in neighbourhood	*p*=0.141 χ^2(4)=6.901		*p*=0.903 χ^2(4)=1.047		***p*=0.046** **χ^2(4)=9.7**	
Size of yard	***p*=0.012** **χ^2(2)=8.829**		*p*=0.106 χ^2(2)=4.486		*p*=0.080 χ^2(2)=5.051	
Importance of blue space	***p*=0.039** **χ^2(5)=11.678**		*p*=0.080 χ^2(5)=9.847		*p*=0.430 χ^2(4)=3.830	
	Independent t-test	Wilcox-Mann Whitney	Independent t-test	Wilcox-Mann Whitney	Independent t-test	Wilcox-Mann Whitney
Visits to non-manicured spaces	*p*=0.174 *t*(72.3)=-1.373	***p*=0.003** ***W*=771.5**	*p*=0.225 *t*(24.4)=-1.244	*p*=0.070 *W*=198	*p*=0.419 *t*(41.2)=-0.816	***p*=0.025** ***W*=194**
Visits to home gardens/yards	***p*=0.018** ***t*(78.8)=-2.418**	***p*=0.021** ***W*=943.5**	*p*=0.880 *t*(34.5)=-0.153	*p*=0.901 *W*=281.5	***p*=0.001** ***t*(43.1)=-3.404**	***p*=0.003** ***W*=186.5**
Visits to rivers and streams	*p*=0.130 *t*(52.8)=-1.536	***p*=0.013** ***W*=746**	*p*=0.830 *t*(42.5)=0.216	*p*=0.089 *W*=149.5	*p*=0.103 *t*(28.9)=-1.683	*p*=0.080 *W*=227
Distance from watercourse	*p*=0.316 *t*(96.5)=1.008	*p*=0.997 *W*=1268.5	*p*=0.060 *t*(23.5)=-1.978	*p*=0.091 *W*=193	***p*=0.004** ***t*(42.9)=3.060**	***p*=0.006** ***W*=522.5**

6.4.4 To what extent do you agree with the following statements about your well-being as it relates to your neighbourhood environment?

Respondents most strongly agreed to the statements related to place attachment: "trees, shrubs, flowers and green space make this a better place" (99% agreed or strongly agreed) and "diverse, mature, healthy trees and green space make this a better place" (95% agreed or strongly agreed).

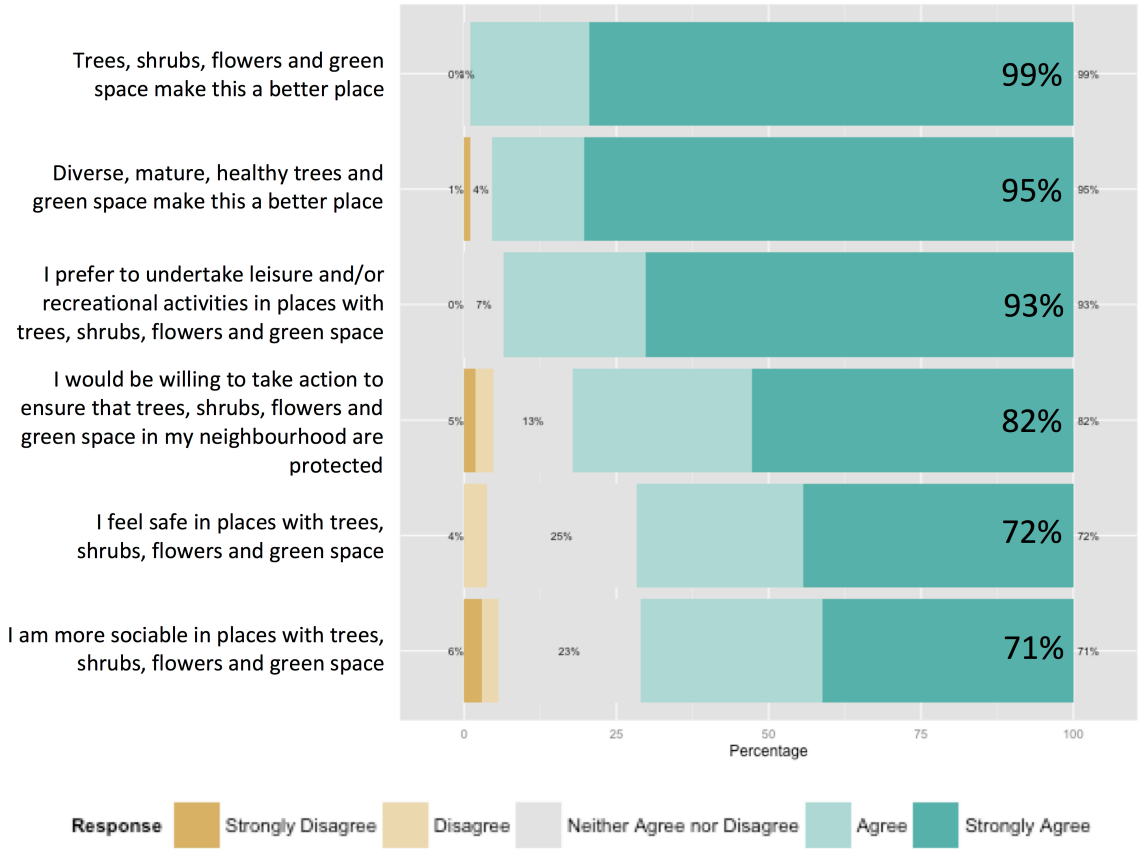


Figure 6-10 Likert scale responses to social well-being statements. Percentages on the far right combine "Agree" and "Strongly Agree" answers. There is no significant difference between study areas. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

Age of respondents is the only demographic variable that consistently demonstrated a significant relationship with five of the six Likert scale statements (One way ANOVA p=0.043; p=0.011; p=0.003; p=0.003; p=7.56×10^{-4}). Generally, there is also an association between the Likert scale

statements and the importance of streams and rivers, wetlands and forests, as contributors to well-being. For more details, refer to Appendix 4.

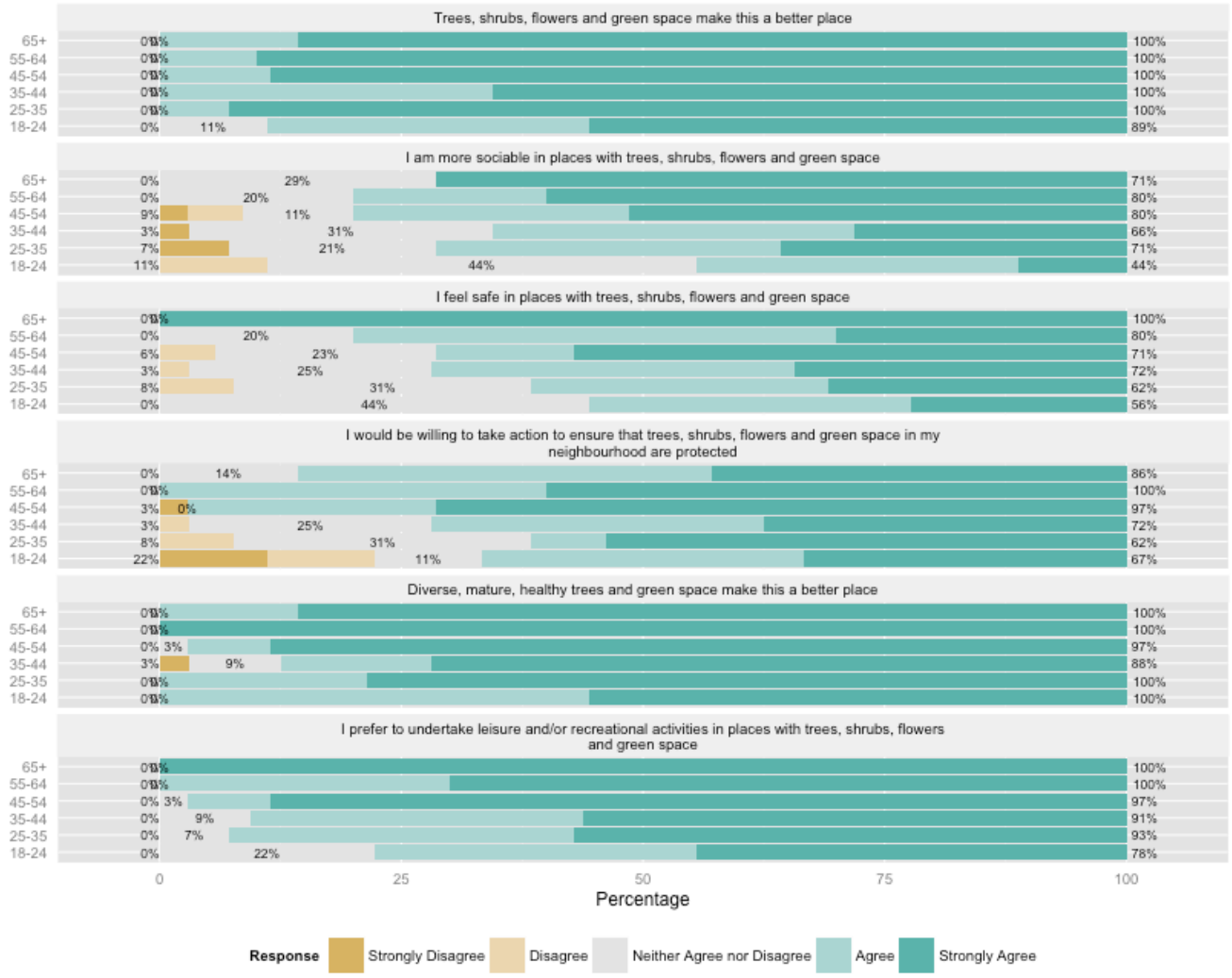
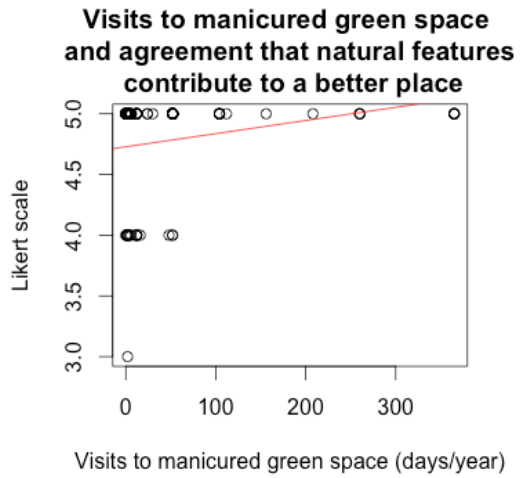


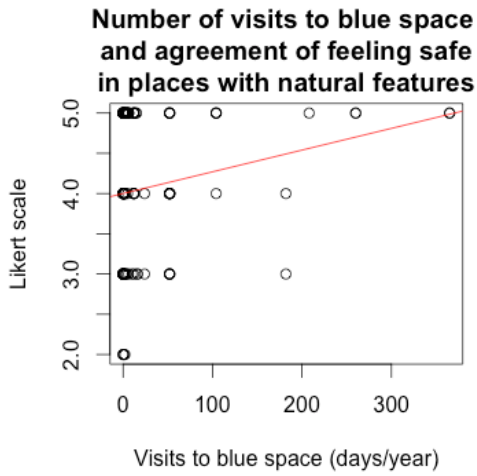
Figure 6.11 Likert scale responses to social well-being statements by Age. Five out of the six statements were dependent on the age of respondents. The higher the age group, the more likely the response will be "strongly agree." Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

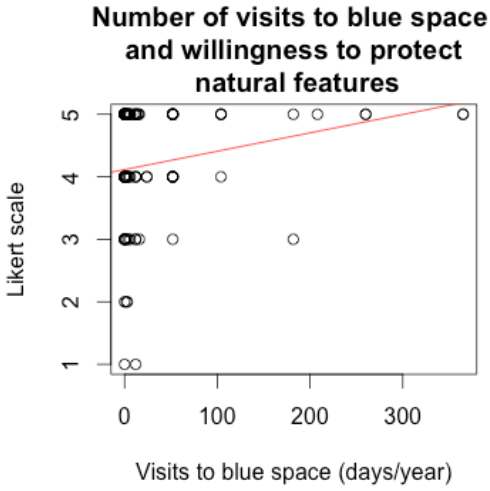
Most of the Likert scale statements were also significantly associated with visits to a specific type of green space. Taking into account all observations, respondents that agreed that "trees, shrubs, flowers and green space make this a better place" tended to visits manicured green space often

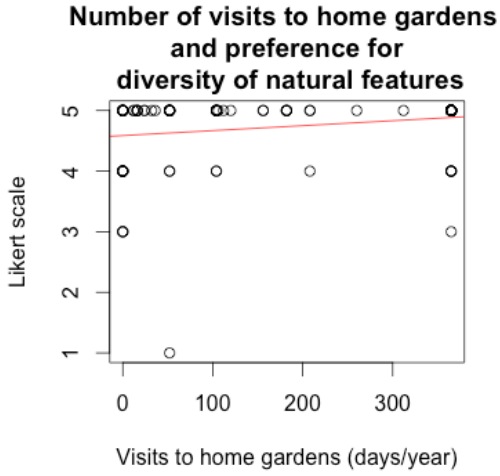
(p=0.026, r=0.225). Those that agreed that "I feel safe in places with trees, shrubs, flowers and green space" and "I would be willing to take action to ensure that trees, shrubs, flowers and green space in my neighbourhood are protected" often frequented streams and rivers (p=0.041, r=0.208; p=0.049, r=0.200). Respondents that agreed that "diverse, mature, healthy trees and green space make this a better place" tended to spend a lot of time in their own home gardens and yards (p=0.040, r=0.202), and those that agreed that "I prefer to undertake leisure and/or recreational activities in places with trees, shrubs, flowers and green space" often visited non-manicured green space (p=0.040, r=0.199). Refer to Figure 6.11 for more details.

When looking solely at the Mississauga sample and the types of spaces respondents visit, a couple of new relationships emerge. Respondents that agreed that "I am more sociable in places with trees, flowers, shrubs and green space" tended to visit non-manicured green space (p=0.048, r=0.279). Respondents that agreed that "I would be willing to take action to ensure that trees, shrubs, flowers and green space in my neighbourhood are protected" spent their days in home gardens and yards (p=0.012, r=0.339) rather than by rivers and streams as mentioned previously for all responses. The relationships between "diverse, mature, healthy trees and green space make this a better place" and home gardens and yards, (p=0.020, r=0.315) and "I prefer to undertake leisure and/or recreational activities in places with trees, shrubs, flowers and green space" and non-manicured green space (p=0.030, r=0.305) are representative of the relationships found for all of the responses. Refer to Figure 6.12, 6.13 and Appendix 4 for more details.









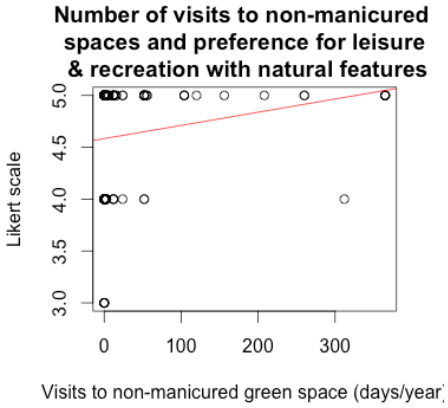


Figure 6.12 From left to right: associations for all responses between "Trees, shrubs, flowers and green space make this a better place" and frequency of visits to manicured green space, "I feel safe in places with trees, shrubs, flowers and green space" and frequency of visits to streams and rivers, "I would be willing to take action to ensure that trees, shrubs, flowers and green space in my neighbourhood are protected" and streams and rivers, "Diverse, mature, healthy trees and green space make this a better place" and frequency of visits to home gardens and yards, and "I prefer to undertake leisure and/or recreational activities in places with trees, shrubs, flowers and green space" and frequency of visits to non-manicured green space. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

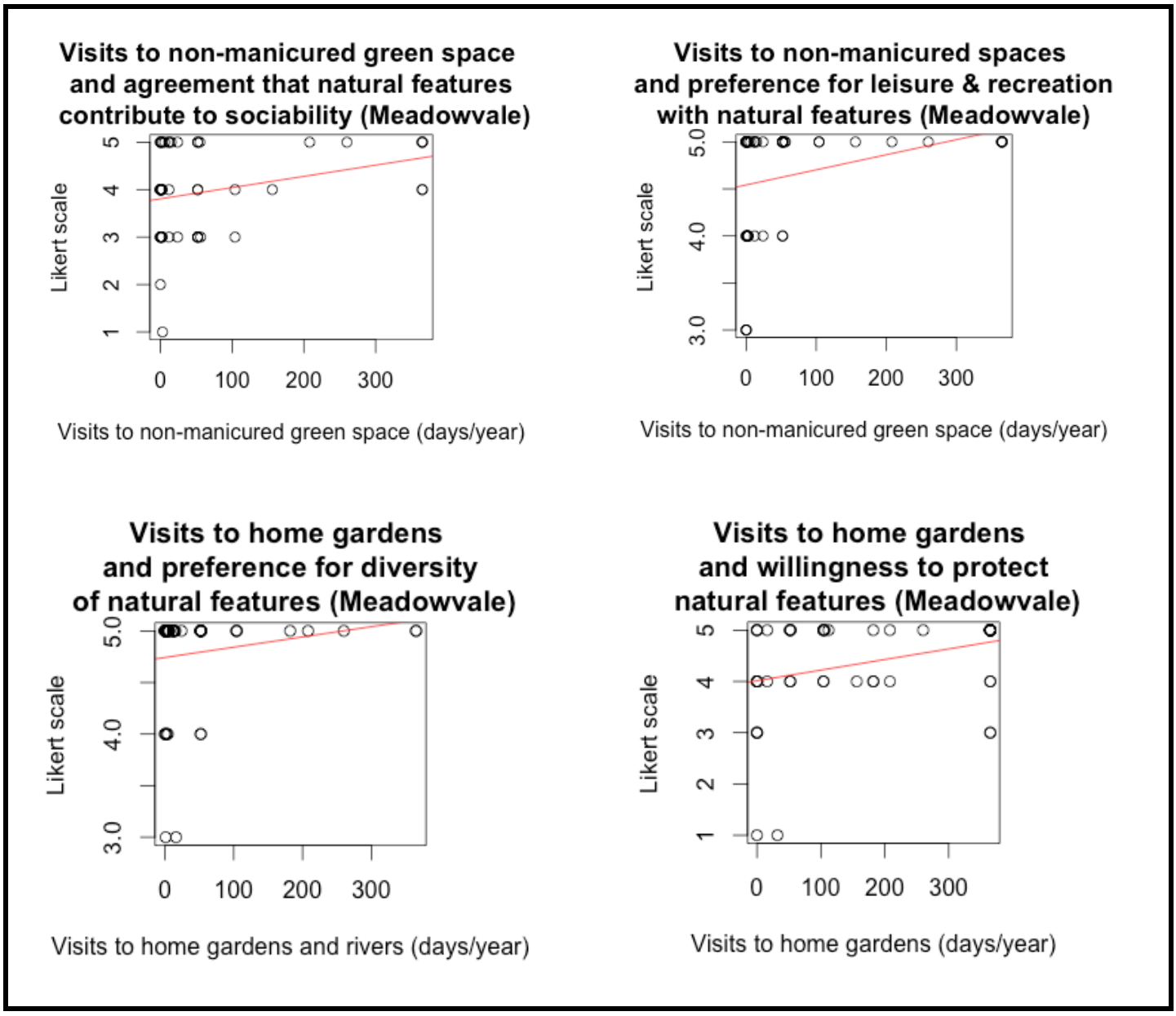


Figure 6.13 From left to right: associations for the Mississauga sample between "I am more sociable in places with trees, flowers, shrubs and green space" and frequency of visits to non-manicured green space, "I prefer to undertake leisure and/or recreational activities in places with trees, shrubs, flowers and green space" and frequency of visits to non-manicured green space, "Diverse, mature, healthy trees and green space make this a better place" and frequency of visits to home gardens and yards, and "I would be willing to take action to ensure that trees, shrubs, flowers and green space in my neighbourhood are protected" and frequency of visits to home gardens and yards. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

6.5 Environmental Social Well-being Index (ESWBI)

The development of a social well-being index related to the environment originated as a strategy to measure and report on how changes in the Credit River watershed's conditions influence the well-being of its residents. The idea was also to monitor if and how CVC's work helps improve the well-being of residents, with a focus on social well-being. As stated in Chapter 5: Methodology, the ESWBI is a combination of scores measuring various aspects of social well-being tied to survey questions.

Table 6.20 Tests exploring relationships between environmental social well-being index score, demographics, property characteristics, and number of visits to different types of green space by location. Each combination of variables was tested and the result, where significant, is shown and bolded. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

	Dependent variable: Environmental Social Well-being Index score					
	All		Brampton		Mississauga	
Independent variables	Kruskal Wallis	Spearman Correlation	Kruskal Wallis	Spearman Correlation	Kruskal Wallis	Spearman Correlation
Age	p=0.115 $\chi^2(5)$=8.862	***p*=0.030** ***r*=0.209**	p=0.155 $\chi^2(5)$=8.030	***p*=0.008** ***r*=0.370**	p=0.900 $\chi^2(5)$=9.522	p=0.7105 r=0.050
Visits to non-manicured green space		***p*=0.009** ***r*=0.260**		p=0.086 r=0.248		p=0.109 r=0.227
Visits to home gardens		p=0.055 r=0.188		***p*=0.031** ***r*=0.305**		p=0.444 r=0.106
Visits to streams and rivers		***p*=0.025** ***r*=0.228**		p=0.161 r=0.212		p=0.076 r=0.248

The ESWBI is significantly weakly related to age (p=0.030, r_S=0.209), visits to non-manicured green space (p=0.009, r_S=0.260), and visits to streams and rivers (p=0.025, r_S=2.228). Income and education, typical indicators of well-being (CWI, 2014), do not influence the index score. Despite the differences in distribution of green spaces, location is also unrelated to the ESWBI score.

6.5.1 Testing the "social reasons" variable

The "social reasons" variable in the index is the sum of all social well-being related responses given through questions II_1_a_ii, II_1_b_ii, II_1_c_ii, II_1_d_ii, II_1_e_ii which ask why respondents visit certain types of green space (See Appendix 2). The reasoning behind creating this variable is that there is an association between frequency of social well-being related responses for visiting different types of space ("social reasons" variable) and number of visits to green space. According to this hypothesis, the more people visit natural areas, the more likely they will be able to give multiple social well-being reasons for going there.

H_0: There is no association between a high number of reasons given for visiting green space ("social reasons" variable) and number of visits to green space. Frequency of response is independent of other variables.

H_A: People who give a high number of response for visiting green space ("social reasons" variable) also indicated a higher level of use (days/year) of green space. Expecting a p = 0.05 or less.

One-way ANOVA, Chi-squared test, correlation, and simple linear regression tests did not allow me to reject this null hypothesis. There is no association between the "social reasons" variable and number of visits to green space. Thus, the construction of a social well-being index was abandoned in this work.

6.6 Factor Analysis

A Scree Test determined that three principal axis factors are present in the data. In accordance with the Kaiser-Guttman rule, or the eigenvalue-one criterion, the eigenvalue of all three factors is greater than 1.00 (λ=1.42; λ=1.25; λ=1.19).

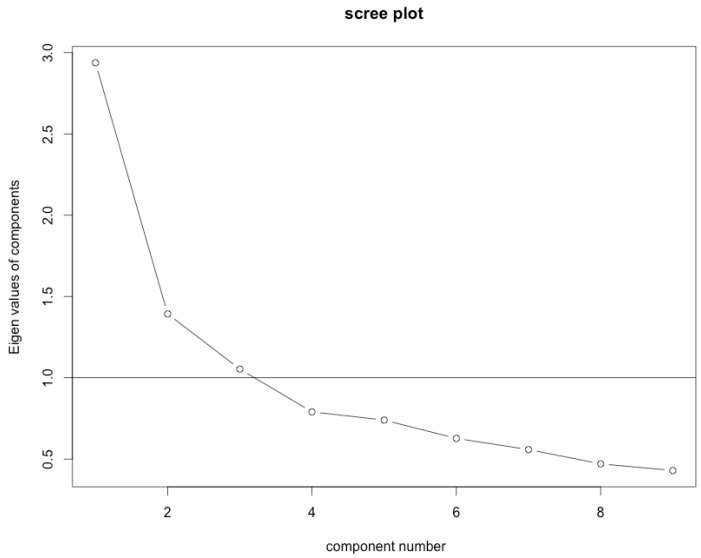


Figure 6.14 Scree test for eigenvalues of principal components of the social well-being measures from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

Principal axis factor 1 was renamed "Social effects" since it groups descriptions of social effects or benefits provided by natural features and areas. Principal axis factor 2 was renamed "Community importance" because of the word community being key in all three statements. "Place attachment" was assigned to principal axis factor 3 since the statements describe what would create a better place, or what would contribute to place attachment.

Table 6.21 Oblique factor loadings for social well-being measures. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

	Social effects	Community importance	Place attachment
I am more sociable in places with trees, shrubs, flowers and green space	0.41		
I feel safe in places with trees, shrubs, flowers and green space	0.81		
I would be willing to take action to ensure that trees, shrubs, flowers and green space in my neighbourhood are protected	0.47		
I prefer to undertake leisure and/or recreational activities in places with trees, shrubs, flowers and green space	0.47		
Trusting the people in my community		0.72	
Being proud of living in my community		0.57	
Feeling a sense of belonging in my community		0.48	
Trees, shrubs, flowers and green space make this a better place			0.41
Diverse, mature, healthy trees and green space make this a better place			0.87
Eigenvalue	1.42	1.25	1.19
Correlation of scores with factors	0.86	0.82	0.88

6.6.1 Principal Axis Factor 1 – Social Effects

The average score for principal axis factor 1 (PAF1) is generally related to the age of respondents (Kruskal Wallis p=0.004, $\chi^2(5)$=17.326) and in Meadowvale only, to the number of years lived in the neighbourhood (Kruskal Wallis p=0.037, $\chi^2(4)$=10.196). Overall, visits to non-manicured green space (simple linear regression p=0.046, F=4.098) and to streams and rivers (p=0.011, F=6.73) also influence the PAF1 score.

Generally, respondents that recognize the "social effects" of the natural environment – social interaction, safety, social cohesion – also recognize the importance of streams and rivers, wetlands and forests, and open green space as contributors to well-being (Kruskal

Wallis $\chi^2(5)=30.392$, $p=1.235\times10^{-5}$; $\chi^2(5)=23.680$, $p=2.502\times10^{-4}$; and $\chi^2(5)=14.264$, $p=0.014$ respectively).

Table 6.22 Tests exploring relationships between Principal Axis Factor 1 - Social Effects, demographics, property characteristics, number of visits to different types of green space by location, and importance of spaces contributing to well-being. Each combination of variables was tested and the result, where significant, is shown and bolded. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

	Dependent variable: PAF1 - Social effects					
	All		Brampton		Mississauga	
Independent variables	Kruskal Wallis	Spearman correlation	Kruskal Wallis	Spearman correlation	Kruskal Wallis	Spearman correlation
Age	***p*=0.004 $\chi^2(5)=17.326$**	***p*= 5.027×10^{-5} *r*=0.382**	*p*=0.113 $\chi^2(5)=8.915$	***p*=0.005 *r*= 0.3911**	***p*=0.010 $\chi^2(5)=15.158$**	***p*=0.005 *r*=0.365**
Years lived in neighbourhood	*p*=922 $\chi^2(4)=0.920$	*p*=0.848 *r*=0.019	*p*=0.730 $\chi^2(4)=2.033$	*p*=0.788 *r*=0.039	**p=0.037 $\chi^2(4)=10.196$**	*p*=0.852 *r*=0.025
Importance of streams and rivers	***p*=1.235× 10^{-5} $\chi^2(5)=30.392$**	***p*=8.168× 10^{-8} *r*=0.491**	***p*=0.013 $\chi^2(5)=14.375$**	***p*=7.172× 10^{-4} *r*=0.463**	***p*=0.003 $\chi^2(4)=16.392$**	***p*=2.85×10^{-5} *r*=0.524**
Importance of wetlands and forests	***p*=2.502× 10^{-4} $\chi^2(5)=23.680$**	***p*=7.309× 10^{-5} *r*=0.374**	*p*=0.101 $\chi^2(5)=9.205$	*p*=0.130 *r*=0.127	***p*=0.003 $\chi^2(4)=16.077$**	***p*=4.077× 10^{-5} *r*=0.515**
Importance of open green space	***p*=0.014 $\chi^2(5)=14.264$**	***p*=0.013 *r*=0.240**	*p*=0.363 $\chi^2(4)=4.329$	*p*=0.231 *r*=0.172	***p*=0.021 $\chi^2(3)=9.753$**	***p*=0.027 *r*=0.293**
	Simple linear regression	Spearman correlation	Simple linear regression	Spearman correlation	Simple linear regression	Spearman correlation
Visits to non-manicured green space	***p*=0.046 R^2=0.040 *F*=4.098**	***p*=0.010 *r*= 0.256**	*p*=0.346 R^2=0.019 *F*=0.905	*p*=0.180 *r*=0.195	***p*=0.030 R^2=0.049 *F*=2.534**	*p*=0.062 *r*=0.263
Visits to home gardens/yards	*p*=0.165 R^2=0.019 *F*=1.955	***p*=0.012 *r*=0.246**	*p*=0.248 R^2=0.028 *F*=1.367	***p*=0.017 *r*=0.336**	*p*=0.443 R^2=0.011 *F*=0.598	*p*=0.238 *r*=0.163
Visits to streams and rivers	***p*=0.011 R^2=0.066 *F*=6.73**	*p*=0.067 *r*=0.187	*p*=0.287 R^2=0.026 *F*=1.162	*p*=0.610 *r*=0.078	***p*=0.011 R^2=0.066 *F*=6.72**	***p*=0.045 *r*=0.280**

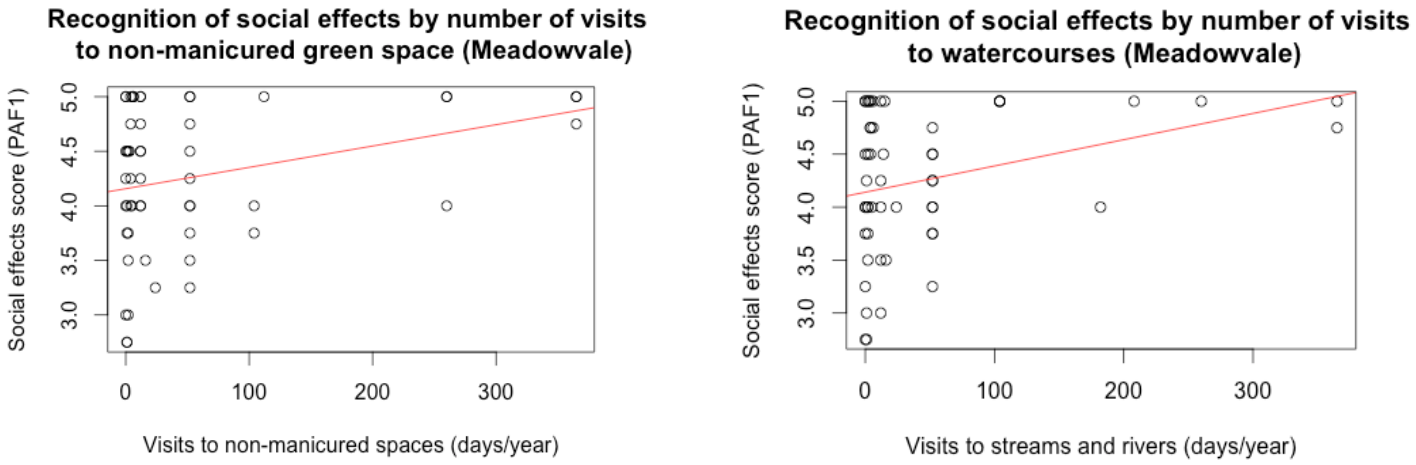


Figure 6.15 Significant relationships between PAF1 and visits to non-manicured green space (simple linear regression F=2.534, p=0.030) and streams and rivers (simple linear regression F=6.72, p=0.011). Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

6.6.2 Principal Axis Factor 2 – Community Importance

The average score for Principal Axis Factor 2 (PAF2) is also generally dependent on the age of respondents (Kruskal Wallis $\chi^2(5)=11.275$). Only for the Brampton sample are visits to functional green spaces (simple linear regression F=5.573, p=0.023) and visits to home gardens and yards (p=0.009, r_S=0.363) influencing factors on the PF2 score. Therefore, it is only in some contexts that frequenting these types of spaces will affect how much importance people place on a sense of community, sense of belonging, and trust of the people in their community.

Overall, there is an association between finding streams and rivers as important contributors to well-being and PAF2 scores (Kruskal Wallis $\chi^2(5)=15.648$, p=0.008). There is also an association between recognizing open green space as important contributors to green space and PF2 scores (Kruskal Wallis $\chi^2(5)=12.809$, p=0.025). Only for the Mississauga sample does recognition of the importance of wetlands and forests affect PF2 scores (p=0.015, r_S=319).

Table 6.23 Tests exploring relationships between Principal Factor 2 – Community importance, demographics, property characteristics, number of visits to different types of green space by location, and importance of spaces contributing to well-being. Each combination of variables was tested and the result, where significant, is shown and bolded. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

	Dependent variable: PAF2 - Community importance					
	All		Brampton		Mississauga	
Independent variables	Kruskal Wallis	Spearman correlation	Kruskal Wallis	Spearman correlation	Kruskal Wallis	Spearman correlation
Age	***p*=0.046 $\chi^2(5)=11.275$**	*p*=0.101 *r*=0.159	***p*=0.050 $\chi^2(5)=11.080$**	***p*=0.043 *r*=0.288**	*p*=0.292 $\chi^2(5)=6.145$	*p*=0.900 *r*=0.017
Importance of streams and rivers	***p*=0.008 $\chi^2(5)=15.648$**	***p*=0.006 *r*=0.263**	***p*=0.038 $\chi^2(5)=11.805$**	*p*=0.091 *r*=0.241	*p*=0.339 $\chi^2(4)=4.530$	***p*=0.049 *r*=0.262**
Importance of wetlands and forests	*p*=0.058 $\chi^2(5)=10.663$	*p*=0.063 *r*=0.180	*p*=0.217 $\chi^2(5)=7.046$	*p*=0.915 *r*=-0.015	*p*=0.106 $\chi^2(4)=7.639$	***p*=0.015 *r*=0.319**
Importance of open green space	***p*=0.025 $\chi^2(5)=12.809$**	***p*=0.003 *r*=0.285**	*p*=0.063 $\chi^2(4)=8.920$	***p*=0.030 *r*=0.310**	*p*=0.238 $\chi^2(3)=4.232$	*p*=0.055 *r*=0.256
	Simple linear regression	Spearman correlation	Simple linear regression	Spearman correlation	Simple linear regression	Spearman correlation
Visits to functional green space	*p*=0.273 R^2=0.012 *F*=1.213	*p*=0.183 *r*=0.136	***p*=0.023 R^2=0.110 *F*=5.573**	*p*=0.113 *r*=0.234	*p*=0.701 R^2=0.003 *F*=0.150	*p*=0.769 *r*=0.042
Visits to home gardens/yards	*p*=0.094 R^2=0.027 *F*=2.851	*p*=0.084 *r*=0.170	*p*=0.095 R^2=0.114 *F*=6.166	***p*=0.009 *r*=0.363**	*p*=0.969 $R^2=2.939\times10^{-5}$ *F*=0.002	*p*=0.956 *r*=-0.008

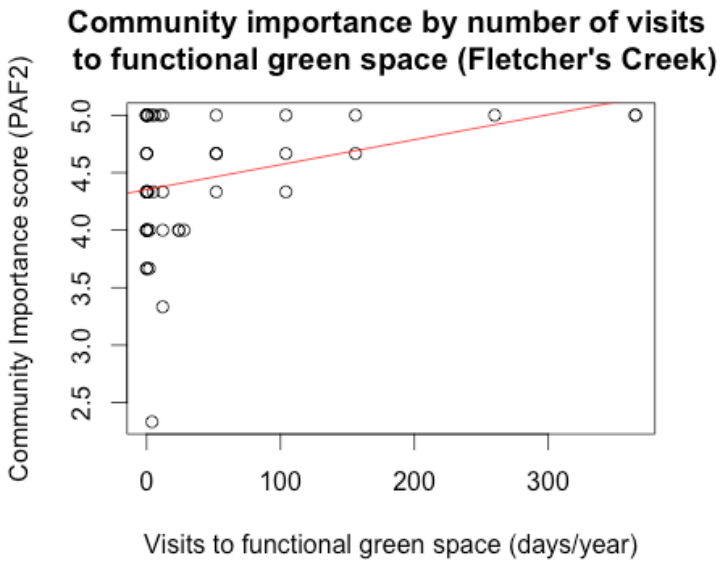


Figure 6.16 Significant relationship between PAF2 score and visits to functional green space (simple linear regression F=5.573, p=0.023). Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

6.6.3 Principal Axis Factor 3 – Place Attachment

The average score for Principal Axis Factor 3 (PAF3) is also generally associated with the age of respondents (Kruskal Wallis $\chi^2(5)=14.586$, p=0.012). There are also significant differences between the scores of ethnic groups, with respondents that identified with Caribbean ancestry scoring on average lower than other ethnic groups (Kruskal Wallis $\chi^2(15)=25.588$, p=0.043). PAF3 scores are also related to visits to manicured green space (simple linear regression F=4.281, p=0.041), non-manicured green space (simple linear regression F=5.141, p=0.026), and home gardens (simple linear regression F=4.2, p=0.030). PAF3 scores are also moderately and weakly correlated with the recognition that streams and rivers (p=0.001, r_S=0.311) and wetlands and forests (p=0.005, r_S=0.268) are important to well-being.

Table 6.24 Tests exploring relationships between Principal Axis Factor 3 – Place Attachment, demographics, property characteristics, number of visits to different types of green space by location, and importance of spaces contributing to well-being. Each combination of variables was tested and the result, where significant, is shown and bolded. Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

	Dependent variable: PAF3 - Place attachment					
	All		Brampton		Mississauga	
Dependent variables	Kruskal Wallis	Spearman correlation	Kruskal Wallis	Spearman correlation	Kruskal Wallis	Spearman correlation
Age	***p*=0.012 $\chi^2(5)=14.586$**	$p=0.006$ $r=0.265$	$p=0.260$ $\chi^2(5)=6.504$	$p=0.138$ $r=0.213$	$p=0.053$ $\chi^2(5)=10.900$	***p*=0.032 *r*=0.285**
Ethnicity	***p*=0.043 $\chi^2(15)=25.588$**		$p=0.175$ $\chi^2(13)=17.552$		$p=0.355$ $\chi^2(12)=13.196$	
Importance of streams and rivers	***p*=0.001 $\chi^2(5)=19.616$**	***p*=0.001 *r*=0.311**	$p=0.119$ $\chi^2(5)=8.767$	***p*=0.020 *r*=0.327**	$p=0.119$ $\chi^2(4)=12.573$	$p=0.133$ $r=0.201$
Importance of wetlands and forests	***p*=0.024 $\chi^2(5)=12.957$**	***p*=0.005 *r*=0.268**	***p*=0.028 $\chi^2(5)=12.538$**	***p*=0.041 *r*=0.290**	$p=0.119$ $\chi^2(4)=7.350$	$p=0.133$ $r=0.201$
	Simple linear regression	Spearman correlation	Simple linear regression	Spearman correlation	Simple linear regression	Spearman correlation
Visits to manicured green space	***p*=0.041 R^2=0.043 *F*=4.281**	$p=0.165$ $r=0.142$	$p=0.137$ $R^2=0.051$ $F=2.294$	$p=0.156$ $r=0.215$	$p=0.152$ $R^2=0.040$ $F=2.118$	$p=0.537$ $r=0.087$
Visits to non-manicured space	***p*=0.026 R^2=0.050 *F*=5.141**	***p*=0.012 *r*=0.250**	$p=0.200$ $R^2=0.035$ $F=1.7$	$p=0.343$ $r=0.139$	$p=0.074$ $R^2=0.064$ $F=3.334$	***p*=0.024 *r*=0.315**
Visits to home gardens/yards	***p*=0.030 R^2=0.040 *F*=4.2**	***p*=0.014 *r*=0.241**	$p=0.253$ $R^2=0.027$ $F=1.337$	$p=0.062$ $r=0.266$	***p*=0.039 R^2=0.057 *F*=3.137**	$p=0.108$ $r=0.221$

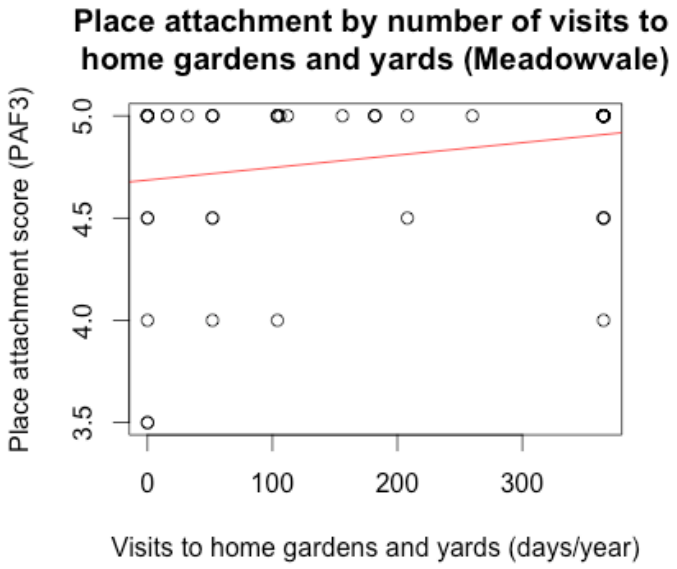


Figure 6.17 Significant relationship between PAF3 score and visits to home gardens and yards (simple linear regression F=3.137, p=0.039). Results from the York University – Credit Valley Conservation "Watershed Well-being" survey conducted October 2013-January 2014.

6.7 Summary

Many of the natural features present in the study areas are associated. The size of front relates to the presence of trees, flowers, and shrubs in a neighbourhood. These are also associated to the distance from the nearest watercourse, size of yard being negatively correlated with distance. The presence of trees recurs often as a dependent variable that influences the perceived link between the natural environment and well-being.

Visits to non-manicured green spaces and to streams and rivers are some of the most influencing spaces. They affect whether respondents agree that outdoor spaces are important to social well-being. These visits also influence PF1 – Social Effects, which deals with recognition of the social interaction, safety, and social cohesion benefits provided by the natural environment.

Age is the most important demographic variable in determining answers. Generally, Likert scale responses are higher for older age groups. In the following Discussion Chapter, these trends will be further explained and differences among the study areas will be highlighted.

Chapter 7: Discussion & Conclusions

The question "how do residents in the Credit River watershed perceive the ways that natural features and areas affect their social well-being?" will be approached in three ways: 1) How respondents explain the relationship between the natural environment and their well-being, i.e. what affects the recognition of this relationship (demographics and habits); 2) How respondents rate the importance of natural features and areas as contributors to their well-being; and 3) How natural areas and features influence the recognition of well-being benefits and the frequency of visiting natural areas.

7.1 Perception of the natural environment and well-being relationship

The overwhelming majority (96.3%) of respondents agreed that there is a link between their well-being and local natural environment. This suggests that there is no need to educate the public on the existence of general environment well-being relationships. Future analysis of additional survey questions dealing with ecosystem services such as flood risk will help identify the well-being benefits of the natural environment that residents have more difficulty understanding. Future research could also investigate what prevents residents from incorporating more exposure to the natural environment into their lifestyle when they agree that doing so would contribute to their well-being.

7.1.1 Respondents recognize the link between their well-being and local natural environment yet do not always visit green space often

Research that explores why people do not act even when they know it is in their best interest, or in the best interest of others, reveal that awareness is insufficient to entice a change in lifestyle. For instance, research showed that knowledge and awareness do not usually lead to pro-environmental behaviour. Communication campaigns and strategies

based on the simplistic assumption that more knowledge will lead to more enlightened behaviour are ineffective (Kollmuss & Agyeman, 2002). Theories clarifying the gap between awareness and action point to self-regulation or self-motivation. "Sustained health behavior change [...] is dependent on more than just good reason to act. Lasting behavioral change is the result of persistent self-regulation" (Pelletier et al., 2004). Along the same lines, authentically self-motivated people will have more interest, excitement, and confidence, which in turn are manifested as general well-being (Ryan & Deci, 2000).

Therefore, to encourage more visits to green spaces there should be a focus on enhancing the motivation and self-regulation of residents. According to Self-Determination Theory, social contexts that facilitate satisfaction of three basic psychological needs - to feel competent, autonomous, and related to others - will promote more optimal motivation and yield the most positive health outcomes (Ryan & Deci, 2000). Protecting natural features and areas that contribute to sense of community, where residents feel related to others, may be a step in the right direction. In practical terms, people desire comfort and convenience, and it is important to identify specific green environmental attributes that facilitate or encourage the use of green spaces (Kollmuss & Agyeman, 2002; Sugiyama et al., 2008).

7.1.2 Effects of living near a watercourse

The four respondents that replied "no" to the question regarding whether they think there is a link between their well-being and local natural environment all lived in Brampton. They lived within 200m of a watercourse (distance from watercourse for respondents indicating "no" being significantly different from those indicating "yes," t-test $t(31)=-7.464$, $p=1.909\times10^{-8}$) and three of the four reported visiting streams and rivers less than 25 days/year (though there is no significant association with the number of visits). Taking into

consideration noted complaints from Brampton respondents on the polluted state of Fletcher's Creek, it is possible that these respondents interpreted the question as whether or not the natural environment *positively* affects their well-being. Perhaps they are negatively affected, living by unpleasant smells and sights of the creek or frustrated with City management, and chose to answer "no."

Alternatively, they could simply be indifferent towards rivers and streams and the proximity of their home to Fletcher's Creek was not a consideration when choosing their place of residence. The four that answered "no" were also consistent when rating to what degree different types of natural areas contributed to their well-being. On a scale from 1 – 5 where 1 is "Not at all" and 5 is "Very much," the average score attributed to streams and rivers and forests and wetlands is 1.5, and an average score of 2.5 given for open green space. These are significantly different scores from respondents that said "yes" and on average attributed to all three types of natural areas a score of 5 (Wilcoxon-Mann Whitney p=0.028; p=0.003; p=0.049). Given the slightly higher score given by the naysayers for open green space, we may suppose that the term "natural" in the question may also have triggered a "no." The well-being of these respondents may be more attuned to non-natural environments with preferences for urban amenities.

7.1.3 Respondents recognize the linkages between the natural environment even if they do not use natural areas frequently

Confirming the findings from the CVC human well-being study (2011), respondents do not need to use natural areas frequently to recognize the linkages between the natural environment and well-being. Furthermore, they do not need to live in proximity of water features. The old and widely-held belief that exposure to nature is salubrious and E. O.

Wilson's theory for the human affinity for nature known as biophilia may be unrelated to how often people visit natural areas (Parsons, 1991; Brown & Grant, 2005).

7.1.4 Narrative Analysis

When asked to elaborate on how their well-being is affected by their local natural environment, very few themes of social well-being emerged (*n*=6). These themes were related to the neighbourhood environment lending a sense of community, allowing respondents to know their neighbours, and offering opportunities for social interaction and communication. Many more examples of mental (e.g. "to de-stress") and physical well-being (e.g. "to exercise") were given, suggesting that the intensity of their linkages with ecosystem services are stronger as noted by the Millennium Ecosystem Assessment (2005). An Australian study has found that perceived greenness of neighbourhoods contribute to perceived physical and mental health in different degrees and in different ways (Sugiyama et al., 2008). Presumably, the greenness of neighbourhoods would contribute to social well-being differently than mental and physical well-being as well. Otherwise, examples of social well-being related to the natural environment seem to be more difficult to conceive or much less intuitive.

Nevertheless, social, mental and physical well-being are interrelated and multiple respondents mentioned a variety of well-being examples throughout the interviews. One respondent hinted at a relationship between all types of well-being, commenting that the natural environment is beneficial for "good exercise; good for the soul; social place." In other words, physical well-being benefits from green space because it offers opportunities to exercise in, which releases endorphins and lifts spirits. This affects mental well-being, and good moods encourages social interaction that contributes to social well-being.

Indeed, recreational walking and social coherence has been shown to be associated with mental health scores (Sugiyama et al., 2008). Pedestrianism, or one's experience of community by walking around, is also based on an individual experience and perception of sense of community (Kim & Kaplan, 2004). Other aspects of social well-being, such as trust in others and membership in voluntary groups, have also been linked to physical well-being by lower mortality (Kawachi et al., 1997; Ziersch et al., 2005).

7.2 Perception of outdoor spaces and social well-being relationship

Not only do the large majority of respondents recognize the relationship between the natural environment and well-being (96.3%), but it also recognizes the linkages between outdoor spaces and social well-being (93.5%). People's values for the environment are known to be related to the cultural and historical context of the society in which they live, how they view nature and their relationship with it (O'Brien, 2005). The context of the study areas may be conducive to recognizing how nature relates to their social well-being as well as their well-being in general.

In Fletcher's Creek, the number of neighbouring trees affects responses (Chi-squared $\chi^2(3)=21.090$, $p=1.008\times10^{-4}$). Respondents that indicated there is no link between outdoor spaces and social well-being lived, on average, in proximity of more than 7 trees while respondents that indicated "yes" only lived near 3-4 trees. This contradicts past findings that green common spaces facilitate neighbourhood social ties (Kuo, 2003). It was expected that a greater number of trees in the respondent's vicinity may inspire them to realize that the aesthetics (or other service provided by trees) of their street encourages social interaction and contributes to their social well-being. Perhaps the streetscape is not utilized as a common space for recreation and leisure and that socializing occurs elsewhere in the

Fletcher's Creek neighbourhood. The small sample size may be also be source of error; only 3 respondents indicated "no."

Similarly to the general well-being question, for all samples a short distance from watercourse corresponds to respondents saying "no" or "I don't know" when asked about outdoor and social well-being relationships ($t(9)=-3.263$, $p=0.01$). Responses are also unrelated to the recognition of streams and rivers as contributors to well-being, nor are they related to the frequency of visits to streams and rivers. Further investigation is needed to explain why living in proximity to a watercourse negatively affects perception of well-being and environment relationships.

For certain samples, the number of visits to various types of outdoor spaces affects responses. This is in line with previous results indicating that longer and frequent visits of green space generate significant improvements of the perceived benefits and well-being among users (Lafortezza et al., 2009). In Fletcher's Creek, there is a significant difference in the mean number of visits to manicured green space for respondents that recognize the relationship between the outdoors and social well-being ($t(42)=-3.469$, $p=0.001$). Respondents that indicated "yes" frequent city parks and public gardens more often than those that indicated "no". Manicured green space offers opportunities for picnics, family outings and team sports, which may have influenced respondents to indicate that there is a relationship between the outdoors and SWB. These types of green space are also the most predominant in the Fletcher's Creek neighbourhood, which may account for why the relationship exists only for this sample.

In Meadowvale, there is a significant difference in the mean number of visits to functional green space for respondents that indicated "yes" and "no" to the existence of an outdoor and social well-being relationship ($t(48)=-3.634$, $p=0.007$). Respondents that indicated "yes" visit functional green space such as school grounds, cemeteries, golf courses, and hospital grounds more often than those that indicated "no". It is likely that visits to these types of spaces involve social interactions through spending family time at the school playground, meeting friends at the golf course and visiting relatives at the hospital. The activities undertaken in functional green space could influence respondents to indicate that they are contributors to social well-being.

However, the mean number of visits to home gardens is higher for Mississauga respondents that indicated "no" to the outdoor social well-being relationship than for those who indicated "yes". Perhaps private spaces lend themselves to solitary activities and are not perceived as social places.

The difference in the relationships found between study areas cannot be explained by the overall number of visits to green space reported by respondents in this study. It is only for visiting non-manicured green space that the rates of visit significantly differ between study areas. Well-being is closely linked to people's identification with particular valued places (O'Brien, 2005), the woodlands of non-manicured green space perhaps being such a place.

Perhaps the distribution of each type of green space within study areas, their accessibility, and their use plays a role. Studies have shown that short distances to green space are associated with increased use (Björk et al., 2008; Schipperijn et al., 2009). Brampton respondents have good access to manicured green space, being in proximity to Woodview

Park and sports fields across from McLaughlin Rd. With these spaces in mind, they replied "yes" to the outdoors/social well-being question. The average income for Meadowvale is higher than that of Fletcher's Creek, which facilitates access to functional green space that require fees, such as golf courses. Mississauga respondents also have on average larger front yards, and presumably larger backyards as well. The size of their private green space influenced their responses and perception of the outdoor and social well-being relationship.

7.2.1 Narrative Analysis

Though examples of social well-being were not readily given when asked about well-being in general, once given the definition that "social well-being relates to your relationships, sense of safety, and community bonds" respondents had no difficulty explaining why the outdoors were important to social well-being. The most prominent responses explaining the importance of outdoor spaces to social well-being dealt with spaces for gatherings and meetings (n=29) that are strongly associated with sense of community.

Gathering and meeting places are tied to the "shared emotional connections" component of sense of community as described by Carpiano & Haystad (2011). They contribute to "the commitment and belief that members have shared and will share history, common places, time together, and similar experiences" (Carpiano & Haystad, 2011). Respondent gave examples of spending time with neighbours and sharing experiences in parks, home yards and streetscapes through exercise, backyard fires, and street parties.

Sense of community was also approached with reference to its "membership" component, where there is a feeling of belonging or sharing a sense of personal relatedness (Carpiano &

Haystad, (2011). One respondent explained that outdoor spaces "give[s] us a common spot to come together to enjoy our world; they join us together." Another stated that parks help "bring the neighbourhood together, meet neighbours, create relationships that last weeks, years." These comments demonstrate that the gathering and meeting opportunities of outdoor spaces are important contributors to the creation of personal connections and sense of community.

Presumably, once residents are gathered outdoors they will engage in conversation and interact. Social interaction was the second most prevailing explanation for why outdoor spaces are important to SWB (*n*=17). In parks and gardens respondents "get together to socialize and increase relations," "walk and talk," and have "conversation with friends and families." These examples correspond to the findings that trees and grass cover are linked with more social interaction in adults. Green common spaces facilitate the development and maintenance of neighbourhood social ties and contribute to more supportive patterns of interrelations among residents by increasing the opportunities for residents to meet and interact (Kuo, 2003).

The relaxing and safe qualities of outdoor spaces ease conversation flow. In green space, "[I] have a better chance to socialize with other people without being afraid of any consequences", "in everyday life you don't get to say hi but you can in a park." These remarks suggest that some respondents feel more comfortable engaging with others in outdoor spaces and parks. It also suggests that parks are unique places, unlike everyday settings, that offer enjoyable and different experiences like the ability to comfortably say "hi". They are also places "to play, talk, socialize, have fun, have a *different* experience [emphasis added]."

Parks and gardens further promote social interaction because they do not require technology: “You don’t take your gadgets when you go in a forest,” “it’s good to get out get fresh air, away from video games,” “it promotes social interaction, you unplug, communicate, look in peoples faces.” Perhaps the aesthetic, relaxing, or holiday-like qualities of green space are sufficient to keep away “gadgets” and improve opportunities for social interaction. It is also possible that in these moments, connecting to nature and with others is prioritized over connecting to the World Wide Web. Respondents told us that they “like being with nature,” to “appreciate the area, ” and “to be able to interact with the environment around me.” Green spaces offer the ability to disconnect with technology, connect with others, and re-connect with nature.

An interesting side effect of social interaction is tied to mental well-being. One respondent noted that “when people are all together – friends – improves peoples attitudes.” Improvement in attitude, or mood, is closely tied to mental well-being and stress-relief. This relationship goes both ways: another respondent explained that ‘when you go in a forest, you have positive conversation with your family when you hike, you don’t fight because there’s no stress.” Sixteen respondents spoke of stress-relief or relaxation in their explanations. Meeting with friends in an environment that provides gathering opportunities improves attitudes, and in turn, a stress-relieving environment encourages positive social interactions with family. In this sense, mental and social well-being are self reinforcing.

This finding is aligned with past research linking social cohesion to mental or psychological well-being. Neighbourhood satisfaction from natural surroundings, an indicator of social coherence, has been linked to psychological well-being (Björk et al., 2007; Sugiyama et al.,

2008). The social and built environment could also effect changes in each other and impact mental health. For instance, a poorly maintained building in poor state of repair may give an impression of poor social cohesion in the neighbourhood and lead to poorer mental health among its residents. Inversely, poorer mental health among residents might also lead to less interest in keeping the building tidy and to engage in social interactions (Araya et al., 2006).

Natural areas are not only places in which to discuss, but also a topic of conversation. For example, a respondent told of relating with others about the beautiful surroundings of a place. Another respondent exchanges foraging knowledge and discusses the natural features of a place:

> "The people I interact with – that's our common ground – regardless of race or culture, career and status. I can teach someone mushrooms and they can teach me edible wildflowers."

As a topic of conversation and as a shared passion, natural features and areas promote social interaction and sense of community.

Recreation and leisure comprised of physical activity, play, and food-related activities were also often mentioned (n=24). Green space is known to facilitate physical activity (Barton, 2009). As expected, respondents play "soccer with friends and other family," "parks are nice for walks and bike rides," to "be active," and to exercise. Physical activity in green space is thought to be motivated by the desire for aesthetic experience (Gobster et al., 2007). Aesthetics are indeed mentioned in some cases: "beauty of garden makes you feel good", and "we made our slice of heaven in the backyard."

7.3 Stewardship

Participation in neighbourhood activities and membership of organizations related to the natural environment is a good indicator of social well-being. The Canadian Index of Well-being uses "the average number of hours in the past year spent volunteering for culture and recreation organisations" as an indicator of well-being (CIW, 2014). Membership contributes to feelings of belonging and allows opportunities for relating to others (Carpiano & Hystad, 2011). In this study, 38.3% of respondents indicated taking an interest in their neighbourhood environment by planting trees, picking up garbage, attending public meetings, and other. Taking an interest in the neighbourhood environment was associated with the respondent's number of years lived in Canada, the number of years lived in their neighbourhood, and the size of their front yard.

Respondents that participated in stewardship activities had, on average, lived in Canada their entire lives ($\chi^2(6)=12.736$, $p=0.047$). In Meadowvale, respondents that took an interest in their neighbourhood environment had also on average been living in their neighbourhood for more than 10 years ($\chi^2(4)=9.7$, $p=0.046$). It appears that living in one place for a long period of time is related to the engagement level of respondents. It's possible that with time, residents are able to widen their social networks and learn of stewardship opportunities being organised in their area. Time also allows attachment to natural features to grow, as demonstrated by the relationship between natural features contributing to a better place and the number of years lived in Canada (Kruskal Wallis $\chi^2(6)=14.119$, $p=0.028$). Respondents living in Canada for more than three years strongly agreed to "trees, shrubs, flowers and green space make this a better place." These findings confirm past research well summarized by Ryan et al. (2001):

> "Participation in volunteer stewardship activities produces an increased appreciation of and attachment to local natural areas and build a constituency for preserving and protecting these precious bits of nearby nature."

With time participants become more attached to their local natural environment, which may motivate longevity in volunteering.

Size of yard is also related to respondents' participation in stewardship activities with percentage of respondents having large yards indicating "yes" more than respondents with small or medium-sized front yards (66.7% of respondents with large yards indicated "yes" versus 34.1% of respondents with medium-sized yards and 28.9% of respondents with small front yards; Chi-squared $\chi^2(2)=8.829$, $p=0.012$). An explanation for this is that the most recurring response of how they participate in stewardship activities was by planting trees and tending to gardens ($n=22$). Many of these plantings occurred on private property, and where there is more space for plants to grow there are more opportunities for residents to be environmental stewards. Size of yard was already confirmed to increase with neighbouring trees ($r_S=0.307$, $p=0.002$) and with the presence of flowers and shrubs (Wilcoxon Mann-Whitney test $W=721$, $p=1.587\times10^{-4}$). Accordingly, respondents that participate in stewardship activities spend nearly twice as much more time in their home gardens and yards than those that are not engaged (Wilcoxon Mann-Whitney $W=746$, $p=0.013$). Much of that time must be spent planting trees, gardening, and interacting with the local natural environment.

After gardening and planting trees, picking up litter is the second-most prominent response as to how respondents engage in stewardship activities ($n=19$). This type of activity may explain the relationship between engagement in stewardship and visits to streams and rivers (Wilcoxon Mann-Whitney, $W=746$, $p=0.013$). Respondents seem to take notice of

litter and pollution in streams and rivers, with many recorded complaints of litter being in or near watercourses. One respondent, when asked why they go to streams and rivers, replied that they go "to clean garbage." Another said that they "constantly work to keep things clean" along Fletcher's Creek.

The open characteristic of non-manicured green space may also be places where litter is easily visible, and where engaged respondents would pick up garbage. Engagement in stewardship activities is also related to the number of visits to non-manicured spaces (Wilcoxon Mann-Whitney, W=771.5, p=0.003). A study of woodlands in England determined that feelings of well-being seemed a significant factor in descriptions of why woodlands and trees of non-manicured green spaces are valued. Conversations about woodlands were usually as part of the wider environment and of everyday life such as concerns over community and safety (O'Brien, 2005). Perhaps visits to non-manicured spaces in this research's study areas also broaden conversation and inspire engagement in stewardship activities to address concerns.

7.3.1 Summary

One of the strongest motivations for environmental stewardship is social belonging, social interactions, or simply spending time with like-minded friends and having fun (Bramston et al., 2010; Ryan et al., 2001; Donald, 1997). Residents seeking social interactions through environmental stewardship not only become attached to new friends, but with time they also grow attached to local natural features and to the place where they live.

7.4 Social Effects: social interactions, safety, social cohesion, recreation and leisure

An approximate measure of social cohesion and social interaction determined by survey questions grouped through exploratory factor analysis (principal axis factoring) was named "Social Effects (PAF1)." Social Effects is related to the age of respondents, its score increasing with age (r_S=0.382, p=5.027×10^{-5}). A discussion on the influence of age is included in Section 7.8.1.

In Meadowvale, Social Effects it is also associated with the number of years lived in the neighbourhood (Kruskal Wallis $\chi^2(4)$=10.196, p=0.037). Respondents that lived in their neighbourhood for less than one year scored the highest with an average of 5 for Social Effects (PAF1). Respondents that scored the lowest, with an average of 4, had been living in their neighbourhood for 3-5 years. Newcomers to Meadowvale may be optimistic about their neighbourhood, keen to explore it, and wanting to ensure it is a good place, which accounts for their high PAF1 scores. After living there 3-5 years, enthusiasm may wear off, and their priorities shift. As they stay longer in the neighbourhood, they grow more attached, establish a favourite place for recreation and leisure, increase their social networks, and their PAF1 score increases again. However, the related Community Importance (PAF2) and Place Attachment scores (PAF3) do not confirm this hypothesis since there is no significant association with years lived in neighbourhood for those variables.

Social Effects (PAF1) can be explained by the number of visits to non-manicured green spaces, in accordance with a past study that suggested that social behaviours are likely to occur more often in areas where people perceive more natural elements. Greenness of

neighbourhoods was associated with walking for recreation, social cohesion and local social interactions (Sugiyama et al., 2008). In the case of this research, visits to non-manicured green space was associated with a score representing preference of undertaking leisure and recreation in places with natural features, willingness to take action to ensure that natural features and areas are protected (measure of social cohesion), feeling sociable in places with natural features and feeling safe in places with natural features.

For all samples, Social Effects (PAF1) score increases with visits to non-manicured green space (r_S=0.256, p=0.010; simple linear regression F=4.098, p=0.046). Typically, non-manicured green spaces contain the largest amount of "trees, shrubs, flowers and green space," the natural features listed in all of the statements that compose the Social Effects (PAF1) score. More frequent visits and higher exposure to these natural features affect respondents' perception of the ways in which the natural environment affects their social well-being. Respondents probably choose to visit non-manicured green space and accomplish their leisure and recreation activities there because it's enjoyable to them. As a result they are more willing to agree to being sociable and safe in those spaces.

Visits to streams and rivers also affect Social Effects, and in Mississauga, they significantly increase with PAF1 scores (r_S=0.28, p=0.045; simple linear regression F=6.72, p=0.011). This is unsurprising considering that preference of undertaking recreational and leisure activities in spaces with natural features is a component of PAF1, and its relationship with visits to streams and rivers supports the idea that "water is an essential ingredient of most recreation areas" (Harrison, 1973). The top activities done near rivers and streams according to respondents are: hiking and walking (n=19), and fishing (n=9). Perhaps in recognizing that these activities are more enjoyable with natural features, and that fish

populations depend on healthy ecosystems, respondents that visit streams and rivers are more likely to be willing to insure that these spaces are protected and score highly for PAF1. Overall, agreeing to the statement "I would be willing to take action to ensure that trees, shrubs, flowers and green space in my neighbourhood are protected" is explained by visits to streams and rivers (r=0.2, p=0.049; simple linear regression F=3.961, p=$<2\times10^{-16}$).

Social Effects (PAF1) scores are also significantly associated to the recognition that streams and rivers, wetlands and forests, and open green space are important contributors to well-being. As previously explained, the frequency of visits to these spaces increase with PAF1 scores, which deal with agreement that social cohesion and social interaction are influenced by natural features. It is therefore unsurprising that respondents also agree that overall well-being being is affected by natural features and areas.

7.5 Community Importance: trust, pride, and sense of belonging

Community Importance is the second principal axis factoring group that combines ratings on the importance of trust of community members, pride of living in their community, and feeling a sense of belonging in their community. For all samples, it is related to the age of respondents. A discussion on the influence of age follows in Section 7.8.1.

For Fletcher's Creek only, Community Importance is also related to the number of visits to home gardens and yards (r=0.363, p=0.009). For Brampton respondents, the main reasons for visiting private green space is to garden (n=27), to sit and relax (n=8) and to enjoy meals outdoors (n=6). Comparably, a study by Freeman et al., (2012) found that gardens are sites for a range of social activities: used for play, eating meals, general socializing, and for BBQ's. It is likely that the act of gardening and the upkeep of the natural features in

one's garden inspire pride and the importance of "being proud in my community" (component of PAF2). Individual sense of pride emerging from gardening is often extended to the wider community as well (Wakefield et al., 2007). Active contact with natural features and feeling comfortable enough to relax and eat outdoors could also impart a sense of belonging in the community. This is supported by a list of the many ways the act of gardening can contribute to aspects of belonging prepared by Diamant & Waterhouse (2010): belonging to those who garden, belonging to those who carry out physical work, belonging to the local community, belonging to those working with nature, etc.

Respondents that score highly for PAF2 also indicated streams and rivers as important contributors to well-being (r_S=0.263, p=0.006). The moderate positive correlation present in Meadowvale (r_S=0.262, p=0.049) may be explained by the value of the Credit River to Meadowvale Village's heritage. The Meadowvale Village Heritage Conservation District is uniquely characterized and defined by the river (City of Mississauga, 2013a), which contributes to sense of place. Living in an area subject to a heritage district plan that involved community members in its development may contribute to feeling that sense of belonging and trusting community members is important.

The recognition of open green space as a contributor to well-being is also weakly positively related to PAF2 scores (r_S=0.285, p=0.003). Open green spaces are often places in which sports activities occur, that require trust in team members. They are also sites in which children play, and where parents feel that it is important to trust community members so that their children are safe. Open green space that is valued for its amenities, natural beauty, or other, also inspires pride in the community. One respondent that exhibited pride

in their neighbourhood explained that they bring visitors to a nearby park for walks, to share with them a place they enjoy.

Only for Meadowvale is the recognition of wetlands and forests as important contributors to well-being moderately associated with PAF2 scores (r_S=0.319, p=0.015). Meadowvale respondents mostly visit non-manicured green space for walks (n=11) and to bring their children (n=11). Parents probably rate the importance of trusting their community members highly (component of PAF2) with the safety of their children in mind. This relationship would also suggest that pride and sense of belonging is shaped by walks in wetlands and forests when they are more accessible.

7.6 Place Attachment: "natural features make this a better place"

The third group determined by principal axis factoring is comprised of the statements that the presence and diversity of natural features contribute to place attachment. Overall, place Attachment (PAF3) increases with age of respondents (Kruskal Wallis $\chi^2(5)=14.586$, p=0.012) and is also related to ethnicity (Kruskal Wallis $\chi^2(15)=25.588$).

Respondents of Caribbean ethnic origin have an average score of 4 for PAF3 while the average score of all other ethnicities is between 4.5 and 5. When considering what makes a "better place," perhaps natural features such as seascapes would be preferred to trees for Caribbean respondents. The quality and cleanliness of Canadian natural environments may also explain the difference in score. A respondent of Caribbean origin explained that they do not fish or gather food locally, but would elsewhere. Another explained: "I used to do it back home but not here." For these respondents, perhaps less pollution or the presence of more familiar food species are what would contribute to a better place.

City dwellers are heterogeneous and hence have different needs and perceptions of urban green space (Germann-Chiari & Seeland, 2004). Ethnic groups differ in their use of park facilities, the social milieu within which they visit the park, and their rating of the psychosocial benefits of park use (Tinsley & Criskeys, 2001). The perception of natural features can also differ by ethnic groups. For example, one study has shown that some African-American residents considered trees as a hazard, a nuisance and a liability (Heynen et al., 2006). It is possible that respondents of Caribbean origin share similar feelings about natural features in their area.

Visits to manicured green space, non-manicured green space, and home gardens/yards all affect PAF3 scores. Likert scale ratings of natural features contributing to a better place are explained by visits to manicured green space (simple linear regression F=5.139, p=0.026). Parks with tended trees, shrubs and flowers that are often visited are therefore valued as contributors to an area's sense of place. They are viewed as advantageous and capable of improving a neighbourhood.

Likert scale ratings of diverse, mature and healthy natural features contributing to a better place are associated with visits to home gardens and yards (simple linear regression F=4.047, p=0.047). It is likely that spending a lot of time gardening increases appreciation for plant diversity and health. A homeowner may be more satisfied when their private garden is in good shape, and they recognize the value of diverse, mature, healthy trees and green space in other areas of their neighbourhood as well.

Visits to non-manicured spaces are not related to the individual Likert scale statements, but when grouped together through principal axis factoring a relationship does appear (simple

linear regression F=5.141, p=0.026). Frequenting wetlands and forests may then foster an appreciation for both the presence and quality of natural features. The natural features of non-manicured spaces contribute to bettering a place when they are numerous and in good health.

7.7 Importance of natural features and areas

7.7.1 Planning for general well-being

When asked whether they believe that there is a link between their well-being and their local natural environment, respondents that indicated "yes" also rated streams and rivers, wetlands and forests, and open green space as important or very important contributors to well-being. All of the different types of spaces are valued by respondents aware of the natural environment affecting their well-being. To ensure the general well-being of residents in their jurisdiction, managers and planners must protect a variety of natural areas that contribute well-being in their own way.

Priority should be placed on streams and rivers, for which the strongest relationships appeared. The degree to which watercourses contribute to well-being generated the greatest chi square statistic compared to forest and wetlands and open green spaces when tested with the perceived relationship between the local natural environment and well-being, participation in stewardship activities, Social Effects (PAF1) score, Community Importance (PAF2) score, and Place Attachment (PAF3) score. Reported concerns of water issues and littering along streams and rivers also calls for a greater consideration of water management.

Strangely, the trend of rating streams and rivers as important contributors to well-being increases with respondents living further away from a watercourse. Respondents that believe there is a link between their well-being and local natural environment live on average more than twice as far as those who indicted that there is no link. Visits to streams and rivers are also increase with distance to watercourses. The total household income of respondents may indirectly affect these responses and habits since these also increases with distance from watercourse.

7.7.2 Planning for social well-being

Respondents that perceived the "social effects" of green spaces, or the benefits of undertaking leisure and recreational activities in places with natural features, being sociable in these spaces, and feeling safe, were related to the number of visits they took to non-manicured green space and to streams and rivers. This relationship, however, was only apparent in Meadowvale, where these types of spaces are easily accessible. In Meadowvale, mon-manicured spaces are also related to the presence and quality of natural features contributing to a better place, or Place Attachment (PAF3). In Fletcher's Creek, Social Effects (PAF1) was only related to the number of visits to home gardens and yards.

It is clear that getting in touch with the natural environment influences how respondents perceive the relationship between the outdoors and social well-being. A variety of accessible spaces will make the relationship apparent and offer benefits, but our results indicate that when given good access, non-manicured green space and streams and rivers will show the link more strongly. This research has shown that the average Meadowvale respondent has a larger front yard than the average Fletcher's Creek respondent and likely has sufficient space for a home garden. Yet visits to home gardens and yards for the

Meadowvale respondent are not related to Social Effects (PAF1). Meanwhile, there is no lack of non-manicured green space and water features in Fletcher's Creek yet they are not visited as often as in Meadowvale. Trails, and increased access points are recommended for the forested areas and watercourse of Fletcher's Creek for residents to recognize and enjoy the social well-being benefits provided by a variety of areas.

For areas deprived of watercourses and non-manicured green space, a focus on gardening opportunities is warranted. Whether private or community gardens, "gardens matter" and offer important opportunities for contact with nature (Freeman et al., 2012). Planners should work to reverse the loss of garden space associated with the trend of building larger homes on smaller plots of land and of paving front yards for car parking spaces (Freeman et al., 2012). Ensuring that garden space is available contributes to offering residents as many opportunities to connect with the natural environment and enjoy its benefits.

Community importance, or how much respondents value trusting the people in their community, being proud of living in their community, and feeling a sense of belonging in their community, is related to visits to functional green space and to home gardens but only in Fletcher's Creek. Access may again be an explanation, with the Fletcher's Creek neighbourhood being in proximity to more sports fields and school grounds than Meadowvale. When they are numerous and accessible, functional green spaces contribute to valuing trust, pride and sense of belonging. Planners need to recognize the value of these spaces not only for recreational and aesthetic reasons, but also for their social well-being benefits.

Visits to home gardens and yards are frequent in Meadowvale yet do not have the same effect on Community Importance (PAF2) as they do in Fletcher's Creek. Garden and yard visits in Meadowvale are however related to Place Attachment (PAF3) and to involvement in stewardship activities, but these visits in Fletcher's Creek do not demonstrate significant relationships. Perhaps the different income and education levels of Meadowvale respondents affect their values. Further research is needed to explore how home gardens in different neighbourhood affect homeowners differently.

7.8 Demographics and neighbourhood characteristics: General trends

7.8.1 Effects of Age

It quickly became apparent that the age of respondents is one of the most important demographic variables to influence responses to questions designed to measure an aspect of social well-being. With old age comes increasing risk for limitations in health and competence, social networks, and financial means, which are all important contributors to social well-being (Pinquart and Sörensen, 2000). Presumably, limitations in mobility also make it more difficult for the elderly to access natural areas and enjoy the benefits of natural features. They also create challenges in visiting friends and family. Therefore, it was unexpected that respondents over the age of 65, old enough to be affected by mobility issues, demonstrated the strongest scores for recognizing the social effects of natural areas, manifesting trust, pride, and sense of belonging, and agreeing that natural features contribute to place attachment.

A brief literature review revealed that this trend is not unusual and gave rise to some illuminating explanations. Helliwell & Putnam (2004) reviewed large-scale surveys

exploring the social context of subjective well-being, happiness, and health. They established that the correlation between age and happiness is curvilinear, meaning that it is higher among the young and the elderly and lower among the middle-aged (Helliwell & Putnam, 2004). Despite that older people are on average less healthy, respondents over the age of 65 tend to have high life satisfaction scores (Helliwell & Putnam, 2004), which may explain their strong ratings of statements that relate social well-being to their neighbourhood environment.

Borawski, Kinney, and Kahana (1996) also developed the term of "health optimists" to describe groups of respondents who define their subjective health in terms of their psychological attitudes and lifestyles rather than physical well-being. Even if they demonstrate a range of physical symptoms that come with old age, they choose to remain optimistic. This optimism may account for the large amount of "strongly agree" and "very important" responses from older respondents for the Watershed Well-being survey.

Pinquart and Sörensen (2000) further explain that the risk of not having enough social contacts grows with age through widowhood and death of peers. However, they have found that with age, the importance of quantity of social contacts becomes less important than the quality of social interactions (Pinquart & Sörensen, 2000). Older people compensate for smaller social networks by forming better quality contacts and still score highly on subjective well-being surveys.

In the end, maintaining "a positive evaluation of one's life associated with good feelings" (subjective well-being) is considered to be one aspect of successful aging (Pinquart & Sörensen, 2000). That older respondents in the study areas are able to overcome challenges

associated with age - losses in social networks and decreased physical health - all the while remaining optimistic, is an indicator of good health and well-being.

7.8.2 Influences of property and neighbourhood characteristics

There was no association between the presence of natural features (trees, shrubs and flowers) and indicating "yes" to the social well-being/outdoors relationship. However, social interaction was one of the most prevailing explanations for why outdoor spaces like parks and gardens are important to social well-being. This suggests that the natural features of streetscapes, for which observations were recorded, may not be as important as the natural features found in parks. Front yards and street trees may not be perceived as social spaces to the same degree as larger, more official public spaces.

Respondents from both areas visited a variety of green spaces at similar rates of occurrence, with the exception of non-manicured green space, which Meadowvale respondents visited more often. It's interesting how the demographic characteristics that differentiate the study areas (education levels, household income) do not affect how often respondents visit manicured spaces, functional green space, streams and rivers, and home gardens and yards. They also do not affect how respondents perceive the relationship between their well-being and the environment. Yet there are still differences between study areas in how visits to various types of green space affects their perception of environment and social well-being relationships.

There is a discrepancy between the two neighbourhoods in terms of the distribution, quality and diversity of natural features and green space. Surface water quality, forest conditions, percent parkland and percent core woodland (see Table 5.5) may offer an

explanation on how visits to certain green spaces are more conducive to perceiving links between the environment and well-being. Though this study has taken into consideration the presence of trees, of flower and shrubs on respondent's front yards, the biodiversity of these natural features may have yielded different results. Gathering data on respondents' home gardens would also aid in explaining why visits to these spaces reveal different relationships in the different study areas. Further studies should test whether the diversity and maturity of trees, flowers, and shrubs explain how visits to green space affect respondents differently.

7.9 Index creation

Presumably, there is inequality in the distribution of well-being benefits enjoyed from natural features. Household and income levels in Meadowvale appear to be related to the larger size of front yard, the presence of flowers and shrubs, number of neighbouring trees, percent parkland, and percent woodland. Despite of this, Social Effects (PAF1), Community Importance (PAF2), and Place Attachment (PAF3) scores do not differ significantly across study areas. To create an informative and effective index of social well-being, it is recommended to incorporate data on respondents' exposure to natural features. The number of neighbouring trees was related to several survey questions and incorporating these numbers into the index might give a better depiction of neighbourhood's social well-being related to the environment.

Another iteration of the survey should also ensure that reported visits to green space are indeed local. This would allow for a better representation of how well the public spaces of a neighbourhood can contribute the well-being of its residents. Many respondents indicated a favourite "local" green space or natural feature located outside of the Credit River

Watershed. Measuring distances traveled for certain types of green space and for favourite spaces could serve as indicators or the quality of local green space.

Lastly, an index that explores accessibility may also demonstrate why similar number of visits to green spaces affects the perception of respondents differently. The nature of visits may be affected by the accessibility of an area. For example, the intention of visiting a forest may be to de-stress when easily accessible. Meanwhile, visits to a far away forest may be more of an expedition for a family wanting to fit as many educational and physical activities as possible in that day to justify the trip there. An exploration of accessibility would also be useful in making management decisions by highlighting the spaces in neighbourhoods that are not being used at their full potential.

7.10 Conclusion

Comments from respondents in the Credit River Watershed have confirmed that social well-being contributes to and is reinforced by all other types of well-being. The many dimensions of social well-being are also interconnected, with engagement in stewardship activities fostering place attachment and motivation for volunteering to seek social interactions. When it comes to which type of green space most affects the various dimensions of social well-being, diversity is best. Depending on the location, streams and rivers, forests and wetlands, open green space and functional green space will all affect social well-being in one way or another, reminding us of the subjective nature of well-being. Therefore, a variety of green spaces must be planned for to provide spaces for gatherings, meetings, and social interactions. Accessible and diverse spaces will increase the chances of providing residents the spaces they require for their social needs.

Summary of suggestions for future research

- Identify the well-being related ecosystem goods and services that respondents have more difficulty perceiving
- Determine the factors preventing residents from interacting with nature more frequently
- Determine whether living in proximity to parkland and woodland affects perception of well-being and environment relationships
- Explore the role of accessibility in well-being and environment relationships
- Explain why living in proximity to a watercourse is related to respondents not perceiving environment and well-being relationships
- Discover how to engage residents in stewardship activities in the early years of establishing in the country and in their neighbourhood
- Explore how home gardens of different neighbourhoods affect homeowners differently
- Determine whether the diversity and maturity of natural features explain how visits to green space affect respondents differently

Summary of planning recommendations

- In planning for the general well-being of respondents, protect a variety of natural areas (streams and rivers, wetlands and forests, and open green spaces) since all are considered as important or very important contributors to well-being. Parks may also be more important than suburban streetscapes as social spaces.
- Prioritize streams and rivers management because:
    - They are considered the most important contributors to well-being
    - Visits to these spaces affect the perception of outdoor and social well-being relationships more strongly
    - They and are in bad shape according to respondents comments and the Credit River Watershed Report Card
- Improve access to non-manicured green space and to streams and rivers (more trails and access points) for residents to recognize and enjoy the social well-being benefits provided by these areas

- Encourage a gardening culture and reverse the loss of garden space to foster engagement in stewardship activities and sense of community
    - Build smaller homes on larger plots of land
    - Avoid paving of front yards for car parking space
    - Provide incentives for community gardens

- Recognize the social-well being functions of accessible sports fields and school grounds which correspond to how much respondents value trusting the people in their community, being proud of living in their community, and feeling a sense of belonging
- Cultivate sense of community by providing green spaces for gatherings, meetings, and social interactions

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Appendix 1: "Watershed Well-being" Survey - Human well-being, ecosystem services and watershed management in the Credit River Watershed

Part I: Watershed IQ

1) What does the term watershed mean to you?
2) What is the name of the watershed you live in?
3) What is the name of the river, stream or creek nearest to your home?
4) Have you heard of Credit Valley Conservation before today? If so, do you remember how you came to know about them?
5) What is your understanding of the role of Conservation Authorities in Ontario?
6) Are you aware of any current or recent issues related to the environment in your neighbourhood, municipality or watershed?

Part II: Natural Environment

1) We want to know about outdoor areas you may visit.
    a. Do you visit forested areas, wetlands and meadows? Why do you go there? And how often?
    b. Do you visit city parks or public gardens? Why do you go there? And how often?
    c. Do you visit green spaces such as school grounds, cemeteries, golf courses and hospital grounds? Why do you go there? And how often?
    d. Do you spend time in home gardens and yards? Why do you go there? And how often?
    e. Do you visit rivers, streams, ponds and lakes? Why do you go there? And how often?
2) Do you benefit from having street-side features such as trees and flower planters in your neighbourhood? If so, in what ways?
3) When you decide to go to a natural area or park, what factors or features do you look for when deciding which place to go to?
4) When you decide to go to a natural area or park, what factors or features prevent you from wanting to go to these places?
5) Please name your favourite local green space or natural feature.

Part III: Understanding of environment and well-being relationship

1) Do you think there is a link between your well-being and your local natural environment? If so, how are you affected?
2) On a scale from 1-5, where 1 is "Not at all" and 5 is "Very Much", do you feel as if the following contribute to your well-being? If so, in what ways?
    a. Streams and rivers in your watershed.
    b. Wetlands and forests in your watershed.
    c. Open green spaces in your watershed.
3) Are you aware of any programs in place to improve these areas?
4) Do you actively take an interest in your neighbourhood environment, for example, by planting trees, adopting-a-trail or attending organized events related to the environment? If so, what do you do?

Part IV: Ecological goods and services

1) On a scale from 1-5, where 1 is "Not at Risk At All" and 5 is "At a High Risk", to what extent do you feel at risk from the following?
    a. Floods and/or flood damage due to extreme weather events
    b. Water shortages
    c. The effects of climate change
    d. The effects of introduced exotic species that quickly spread
    e. The effects of rapid urbanization and changing land use over time
    f. Water quality
2) If you could change up to three things in your local environment to improve your well-being, what would they be? Why?
3) Do you rely on your local environment to provide you with any products or materials, including things such as firewood or fish? If so, please tell us which products or materials.
4) On a scale from 1-5, where 1 is "Not Important at All" and 5 is "Very Important," how important are the following to you?
    a. Ability to fish
    b. Ability to grow and gather food
    c. Ability to drink tap water
    d. Ability to swim in local streams, rivers and lakes
    e. Ability to gather firewood

Part V: Social and mental well-being

1) Mental well-being relates to your productivity, concentration, stress and satisfaction with life. Is your mental well-being affected by your outdoor environment? Why?
2) On a scale from 1-5, where 1 is "Strongly Disagree" and 5 is "Strongly Agree," to what extent do you agree with the following statements about your mental well-being?
    a. I am satisfied with my life
    b. I feel like I lead a stressful life
    c. When stressed, I often seek out natural areas as a setting for relief, i.e. I go to a park
    d. I regularly go on walks through or sit in natural areas to relax
    e. I feel more relaxed after spending time in manicured green space including parks and public gardens
    f. I feel more relaxed after spending time in non-manicured green space including wetlands, forested areas, and meadows
    g. I feel more relaxed after spending time in school grounds, cemeteries, golf courses, and hospital grounds
    h. I feel more relaxed after spending time in private green spaces including home gardens and yards
    i. I feel more relaxed after spending time in spaces with street-side features including trees and flower planters
    j. I feel more relaxed after spending time near water features including rivers, streams, ponds and lakes
    k. I feel more relaxed when looking out of windows at green or natural areas
3) Social well-being relates to your relationships, sense of safety, and community bonds. Do you feel that outdoor spaces, like parks and gardens, are important to your social well-being? Why?

4) On a scale from 1-5, where 1 is "Strongly Disagree" and 5 is "Strongly Agree," to what extent do you agree with the following statements about your well-being as it relates to your neighbourhood environment?
    a. Trees, shrubs, flowers and green space make this a better place
    b. I am more sociable in places with trees, shrubs, flowers and green space
    c. I feel safe in places with trees, shrubs, flowers and green space
    d. I would be willing to take action to ensure that trees, shrubs, flowers and green space in my neighbourhood are protected
    e. Diverse, mature, healthy trees and green space make this a better place
    f. I prefer to undertake leisure and/or recreational activities in places with trees, shrubs, flowers and green space

Part VI: Values & personalities

1) The following statements are principles that may or may not matter to you. On a scale from 1-5, where 1 is "Not Important At All" and 5 is "Very Important," please indicate how important each principle is to you.
    a. Leading an exciting life filled with stimulating experiences
    b. Trusting the people in my community
    c. Existing in harmony with other species
    d. Being proud of living in my community
    e. Showing self-discipline, self-restraint and resistance to temptations
    f. Protecting the environment and preserving nature
    g. Having the right to lead or command
    h. Feeling a sense of belonging in my community
    i. Having material possessions and money
    j. Social justice, and caring for the weak
    k. Unity with nature and fitting into nature
    l. Being curious, interested in everything and exploring

Part VII: Demographics

1) How old are you?
    a. 18-24
    b. 25-34
    c. 35-44
    d. 45-54
    e. 55-64
    f. 65 or older
    g. Refused
2) We all live in Canada, but our ancestors come from many different ethnic backgrounds. What is the **main** ethnic background of your ancestors?
3) How long have you lived in Canada?
4) How long have you lived in your current neighbourhood?
5) Do you own or rent your place of residence?
6) Which of the following best describes your household composition?
    a. Single person
    b. Couple
    c. Single person with one or more children
    d. Couple with one or more children
    e. Roommates
    f. Intergenerational

7) Which is the highest level of education you have completed?
    a. Grade School
    b. High School
    c. Post-Secondary (college diploma or bachelor' s)
    d. Graduate or Post-Graduate University Degree
    e. Refused
8) What is your postal code?
9) Which category best describes your total household income (before taxes) in 2012?
    a. Less than $40,000
    b. $40,000 to $59,999
    c. $60,000 to $79,999
    d. $80,000 to $99,999
    e. $100,000 to $119,999
    f. $120,000 to $159,999
    g. $160,000 or more
    h. Refused

Part VIII: Surveyor Observations

1) Gender
    a. Male
    b. Female
2) Sidewalk presence
    a. None
    b. One
    c. Two
3) Sidewalk separated from road?
    a. Yes
    b. No
4) Size of front yard
    a. Small
    b. Medium
    c. Large
5) Fenced in front yard?
    a. Yes
    b. No
6) Presence of trees
    a. Yes
    b. No
7) Presence of flowers or shrubs
    a. Yes
    b. No
8) Number of trees in three home span (respondent + immediate neighbours)
    a. 1-2 trees
    b. 3-4 trees
    c. 5-6 trees
    d. 7+ trees
9) Assumed maturity of trees (based on estimated height and girth)
    a. Young
    b. Mature – middle aged
    c. Mature – very old

Appendix 2: 22 Social Reasons statements

Table A2.1 Component of the Environment Social Well-being Index. Social well-being related responses to why respondents visit different types of green space.

Number	II_1_a_ii: Reasons for visiting manicured green spaces	
1	II_1_a_ii_b	Kids
2	II_1_a_ii_d + II_1_a_ii_e	Picnics and BBQ
3	II_1_a_ii_f	Sports/Recreation
4	II_1_a_ii_j	Family Time
5	II_1_a_ii_l	Social Events (i.e. parties and weddings)
6	II_1_a_ii_o	Entertainment and special events (i.e. concerts)
	II_1_b_ii: Reasons for visiting non-manicured green spaces	
7	II_1_b_ii_b	Kids
8	II_1_b_ii_n	Family and social activities
	II_1_c_ii: Reasons for visiting functional green spaces	
9	II_1_c_ii_a	Golfing
10	II_1_c_ii_d	Sporting fields
11	II_1_c_ii_e	School grounds
12	II_1_c_ii_g	BBQ
13	II_1_c_ii_i	Socializing
14	II_1_c_ii_k	Recreation/Exercise
15	II_1_c_ii_m	Kids
	II_1_d_ii: Reasons for visiting home gardens/yards	
16	II_1_d_ii_b	Fires
17	II_1_d_ii_d	Kids
18	II_1_d_ii_e	Socializing
19	II_1_d_ii_f	BBQ/Outdoor meals
	II_1_e_ii: Reasons for visiting blue space	
20	II_1_e_ii_o	Kids
21	II_1_e_ii_q	Socializing
22	II_1_e_ii_t	Family time

Appendix 3: Examples of the ways outdoor spaces are important to social well-being

Table A3.1 All responses to question 3, part V: "do you feel that outdoor spaces, like parks and gardens, are important to your social well-being? Why?"

Gathering and meeting places	1) "Gather together […] place to meet" 2) "Neighbours get together and meet outside, contributes to a sense of community" 3) "Gather together, street parties, meeting people going through parks and trails" 4) "We'll have a fire with neighbours, sit outside and talk" 5) "Good to see people get together" 6) "Where people gather, get to talk and get to know their neighbours" 7) "Gathering place, meet a lot of people" 8) "Utilized for meetings" 9) "Space to meet neighbours" 10) "You get to know your neighbours" 11) "Great way to meet people in the neighbourhood" 12) "When people are all together – friends – improves peoples attitudes" 13) "It's a great place to meet or watch people" 14) "They promote an area for people to gather in and exercise" 15) "Helps bring the neighbourhood together, meet neighbours, create relationships that last weeks, years" 16) "They give us a common spot to come together to enjoy our world; they join us together" 17) "[They are the] places to be, 300-400 people on a Saturday! In the summer the park is full, big family groups, lots of groups" 18) "You meet people in your community"
Places to talk and interact	1) "Where people gather, get to talk and get to know their neighbours" 2) "We'll have a fire with neighbours, sit outside and talk" 3) "Interact with people" 4) "Get together to socialize and increase relations" 5) "The people I interact with – that's our common ground – regardless of race or culture, career and status. I can teach someone mushrooms and they can teach me edible wildflowers." 6) "You see beautiful surroundings and you are better able to relate with others" 7) "Have better chance to socialize with other people without being afraid of any consequences" 8) "Conversation with friends and families" 9) "Walk and talk" 10) "Place to play, talk, socialize, have fun, have different experience." 11) "You get to interact with people. In everyday life you don't get to say hi but you can in a park." 12) "Because you don't take your gadgets when you go in a forest, you have positive conversation with your family when you hike, you don't fight because there's no stress." 13) "100%. It promotes social interaction, you unplug, communicate, look

	in peoples faces"
Destination and outings	1) "We go out with groups of people, family and friends" 2) "Going out on dates or family outings" 3) "Families need to get out more together" 4) "Important because that's how people should get out, enjoy it" 5) When take kids to park, good to socialize with other people 6) "'5.' Nice to go for walks with someone; go for a coffee or drink and go for a walk [at] Port Credit" 7) "When everyone's out, and you can congregate, nice environment to get to know the people around you" 8) "They're good places to go with people"
Community	1) Neighbours get together and meet outside, contributes to a sense of community
Physical activity and play	1) "Soccer with friends and other family" 2) "Going out on dates or family outings; parks are nice for walks and bike rides" 3) "Used for meetings, recreation, walking, dogs" 4) "Relaxing time, kids have fun in the park, they can do what they want (run around)" 5) "For kids to play" 6) "Walk and talk" 7) "Most of the sports we do are in the parks, a place to gather, walk dogs with friends, soccer, volleyball, baseball" 8) "Kids use outdoor facilities in the summer" 9) "Nice to go for walks with someone, go for a coffee or drink and go for a walk (at Port Credit)" 10) They promote an area for people to gather in and exercise" 11) Walks with groups (teacher's groups) 12) "It's a gathering place for kids to play" 13) "Because you don't take your gadgets when you go in a forest, you have positive conversation with your family when you hike, you don't fight because there's no stress" 14) "I like taking my kids out for walks" 15) "Going for walks with friends, often go for hikes with family" 16) "Being active, especially for young kids" 17) Walks with others
Food activity	1) "It depends on good weather. We can go for BBQ, etc." 2) "Picnics with family. Inside you watch TV, outside is time with the family" 3) "Great place to meet up with people, have picnics with kids" 4) "More parks all people meet and picnic, effect is social" 5) "'5.' Nice to go for walks with someone, go for a coffee or drink and go for a walk (Port Credit)" 6) Sense of community; place to gather; picnic; fundraiser; band playing
Stress relief and relaxation	1) "Stress relieving" 2) "Want to relax and just walk" 3) "De-stress" 4) "State of mind – interaction with people makes more relaxed" 5) "It gives you a different sense and feel of the environment; don't feel

	claustrophobic and more relaxed" 6) "Relax" 7) Because it allows you to be in a more relaxed environment and therefore allows you to be in a better mood so you can cope with everyday stress better and feel safer. 8) "Relaxation" 9) "Relaxing time, kids have fun in the park" 10) "Relieves stress, takes your mind off of work issues" 11) "For health relaxation is extremely important" 12) "More relaxing" 13) "Yes, reduces stress" 14) "Because you don't take your gadgets when you go in a forest, you have positive conversation with you family when you hike, you don't fight because there's no stress" 15) "Want to feel relaxed when walk out front door; nice to get somewhere (outside City, etc)" 16) "Somewhere to go away from concrete jungle; calming effect"
Connection to nature; nature appreciation	1) "Like being with nature" 2) "You reconnect with nature" 3) "Important to give us some kind of connection to nature. We need them but we need other things more than parks." 4) "Very important to me. It's nice having people over to appreciate the area." 5) "I like to be able to interact with the environment around me."
Escape	1) "Good to get out get fresh air, away from video games." 2) "Important when you live in a large city to have somewhere to escape from noise and pollution." 3) "Want to feel relaxed when walk out front door; nice to get somewhere (outside City, etc.) 4) "Somewhere to go away from concrete jungle; calming effect."
Fresh air	1) Fresh air = health 2) "Relaxation, air is more pure." 3) "Good to get out get fresh air, away from video games."
Enjoyment; happiness, fun, feel good	1) "They just make me feel alive and happy." 2) "Relax, makes me happy – more secluded where we are, more happy" 3) "Kids have fun in the park, they can do what they want (run around)" 4) "Beauty of garden makes you feel good" 5) "Important because that's how people should get out, enjoy it." 6) "When people are all together friends improves peoples attitudes" 7) "Affects psychological well-being; socializing with friends" 8) "Go outside and have fun, can't do it on a regular street" 9) "Place to play, talk, socialize, have fun, have different experiences" 10) "If you live in a space that has proximity to green space you feel better" 11) "Find that it's important for us to be outside and enjoy the outdoors. These things are readily available around here. Don't have to go too far for it." 12) "They give us a common spot to come together and enjoy the world; they join us together"
Pleasant (I	1) "Like being with nature"

like it)	2) "Not really in a park, we made our slice of heaven in the backyard." 3) "I like to be able to interact with the environment around me." 4) "Space to meet neighbours, love to put seeds in ground and watch them grow." 5) "I love sitting outside." 6) "It's nice to have [parks] close to you."
Quality of life	1) "Definitely. Tied to everyday life. If we have green space in proper places it enhances life and quality of life. I'm disappointed when places lack them."
Safety and comfort	1) "I can leave my door unlocked." 2) "If you feel more comfortable in your neighbourhood you go out more." 3) "Gathering places and safety"